RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER

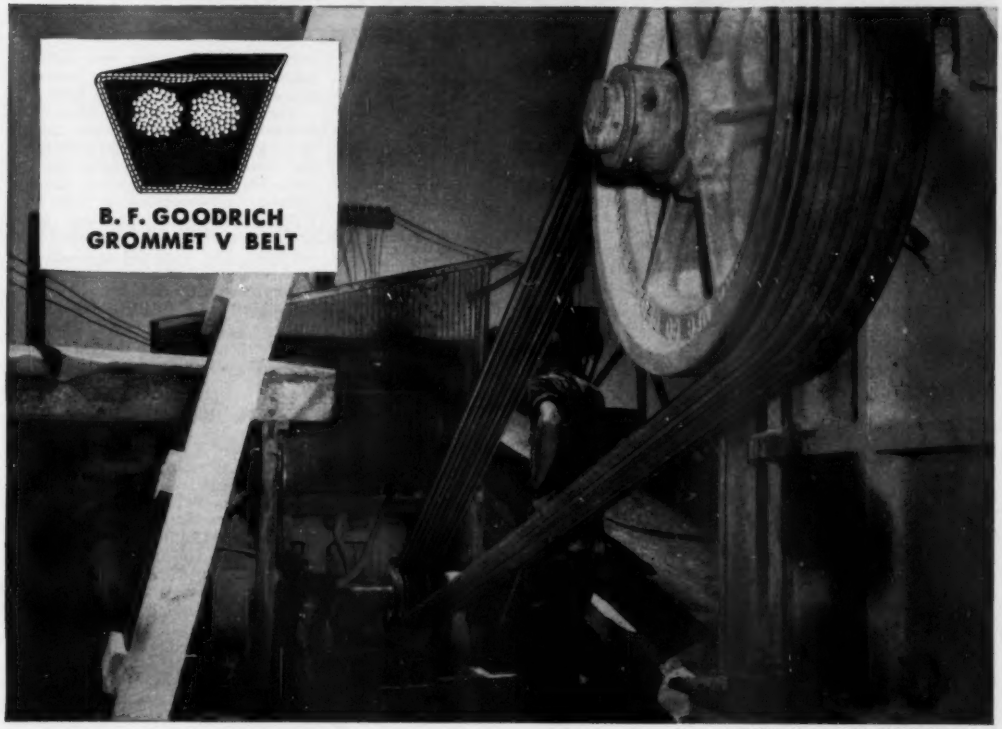


Photo courtesy of Valley Limestone & Gravel, Inc., Farmington, Iowa

Production increased 25 per cent with B.F.Goodrich grommet V belts

B. F. Goodrich often cuts belt costs 20 to 50 per cent

THESE belts drive a rock crusher 9 hours a day, six days a week. In addition to the long hours belts are exposed to dampness, oil and sharp grit. Still worse, the crusher abuses the drive with every impact of its jolting, grinding action. Previously, the operators had "tried everything" including flat belts, other V belts, even a chain drive. But mechanical trouble and production hold-ups continued.

The B. F. Goodrich grommet belts were tried at the suggestion of a BFG distributor's salesman. When the picture above was taken the grommet belts had been in operation almost 2 years. The grommet belts' record: production up 25%, large savings in labor and maintenance time, no belt replacement costs, better working conditions for men—less noise, greater safety. BFG grommet belts can be counted on to *save* because of:

No cord ends—A grommet is endless, made by winding heavy cord on itself to form an endless loop. It has no overlapping ends. Because most of the failures in ordinary V belts occur in the region where cords overlap, the endless cord section in a grommet V belt eliminates such failures.

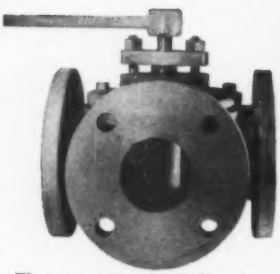
Concentrated cord strength—All of the cord material in a B. F. Goodrich grommet multiple-V belt is *concentrated* in twin grommets, positioned close to the driving faces of the pulley. No layers of cords to rub against one other and generate heat; cord and adhesion failures are reduced.

Better grip, less slip—Because a grommet is endless, a grommet V belt is more flexible, grips the pulleys better. Size for size, grommet multiple-V belts will give ⅓ more gripping power, pull heavier loads with a higher safety factor.

Only B. F. Goodrich has the grommet!—No other multiple-V belt is a grommet V belt (U.S. Patent No. 2,233,294). Now available in C, D and E sections. See your local B. F. Goodrich distributor. *The B. F. Goodrich Company, Industrial & General Products Division, Akron, Ohio.*

Grommet V Belts BY
B.F.Goodrich
RUBBER FOR INDUSTRY

The SIMPLICITY of HONEYWELL 3-WAY TRANSFER VALVES WILL SAVE YOU MONEY AND SPACE!



THE HONEYWELL transfer valve is a simple, compact valve designed for diverting flow from one line to another—such as cooling water from one condenser to another or oil from one strainer to another. It replaces two conventional valves and fittings. Operates by movement of single lever . . . no chance of opening or closing both lines simultaneously.

Sizes 1½ to 8 inches . . . screwed or flanged. Available in high tensile iron body with iron or bronze trim. Body rating 125 lbs. ASA facing and drilling. Maximum inlet pressures 30 psi to 10 psi. Cost is low . . . act quickly.

MINNEAPOLIS-HONEYWELL REGULATOR COMPANY, *Industrial Division,* 1914 Windrim Ave., Philadelphia 44, Pa.

MINNEAPOLIS Honeywell VALVE PRODUCTS First in Controls

'ROUND ABOUT with the editors in field and office

Guards are Ambidextrous

Sir:

In the November issue of PLANT ENGINEERING I noticed the article "Lockheed Zones Its Plants for Security." Noting the picture of the guards at target practice makes me wonder. Are all their guards trained

This picture appeared in the article

Same guards practice with right hands

to shoot left handed or did you just print the picture backwards? *G. G. Gaddis.*

Editor's Note: Lockheed Aircraft Corp. was called to the rescue and they replied: ". . . all Lockheed guards are required to shoot as well with their left hands as they do with their right—in case they are wounded in the right hand."

Traveling Show Teaches Industrial Battery Maintenance

THE INDUSTRIAL Battery Division of Gould-National Batteries, Inc., Trenton, is producing a one-hour-long Broadway-type show which will tour large industrial cities early in 1952. The review, entitled "Gould Nuggets of 1952," comprises a series of entertaining carnival acts explaining Gould's new Plus Performance Plan.

Invited to attend will be plant engineers, plant superintendents, supervisory personnel, materials handling engineers, maintenance men, purchasing agents, battery-room supervisors, and others concerned with the care and maintenance of industrial storage batteries and equipment operated by batteries.

The show contains a library of information on how to select, charge and handle, maintain, and determine the condition of industrial storage batteries used in industrial trucks, railroad air-conditioning and car-lighting, railroad signalling, telephone systems, alarm systems, and utilities. The material is available, free, to industrial battery users.

Anyone wishing additional information on when this show will be in your neighborhood may write to Industrial Division, Gould-National Batteries, Inc., Trenton 7, N. J.

Industrial Electrical Show

THE SIXTH Annual Industrial Electrical Show and first Technical Conference, a new addition to the show, will be sponsored by the Electrical Maintenance Engineers Association of Southern California on March 20, 21, 22, 1952. The theme of the show will be "Planned Productive Maintenance" and will be held in the Veterans' Memorial Building in Culver City, Calif.

Prominent leaders in industry will participate in presentations on "Planned Lighting Maintenance," "Planned Equipment Maintenance," and "Planned Plant Electrical Distribution Maintenance."

Readers wishing additional information regarding this show may contact Richard Rogers, Ace Day and Night Electric Co., Los Angeles, Calif.

Insurance Group Uses Accident Data Article as Guide

PLANT ENGINEERING recently received a letter from William J. Franklin, of the Royal-Liverpool Insurance Group, 150 William St., New York 38, N. Y., commenting on the article on using accident data.

"In the August issue of PLANT ENGINEERING there was an article of direct importance to our work here, plant safety. The article was titled 'Making Safety Work Effective by Using Accident Data As A Tool.'

"The author outlined a technique of considerable possible value in accident control, so it is our wish to try it out. To this end, an Accident Control Chart, and instructions for its use were drawn up.

"Our method differs from the one

(Continued on next page)

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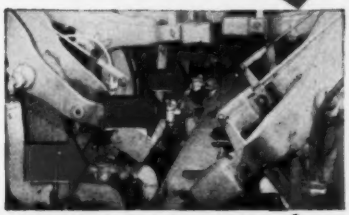
ARMSTRONG UNIT TRAPPING

DON'T DO THIS!

DO IT THIS WAY!

THE SAVINGS WILL PAY FOR THE EXTRA TRAPS!



SAVES 14 TONS COAL MONTHLY . . . that's the profitable result of changing over to Armstrong Traps . . . *M. Wile and Company, Buffalo, N. Y.*

2-3 HOURS FASTER HEAT-UP . . . starch drier takes new lease on life after Armstrong Unit Trapping . . . *Industrial Grain Products, Ltd., Fort William, Ontario*

40° TEMPERATURE RISE . . . pyrometer readings on flatwork ironer rolls prove performance of Armstrong Unit Trapping . . . *Peter Bent Brigham Hospital, Boston, Mass.*

It is false economy to drain more than one coil, kettle, unit heater or other steam-consuming unit with a single trap. In the first place a single trap for several units must be larger and higher priced than the individual trap on *each* unit, so the difference in original cost is not as great as it might first appear. But the difference in performance can be *tremendous.* The slightest difference in condensing rate between two units will cause a difference in steam pressures between the units. Even a few ounces pressure difference will hamper drainage of condensate and, most important, will prevent or retard flow of air from the lower pressure unit. The result is widely varying and subnormal temperatures, less heat output, slower heat-up, less production and higher operating costs.

Don't be penny wise and pound foolish. Install a trouble-free Armstrong trap on each steam-consuming unit in your plant. Call your Armstrong Representative today.

ARMSTRONG MACHINE WORKS
912 Maple Street • Three Rivers, Michigan

SEND FOR THE STEAM TRAP BOOK —

SEE OUR CATALOG IN SWEET'S or C&E

36 pages of practical data on selection, installation and maintenance of traps. Yours for the asking.

ARMSTRONG STEAM TRAPS

PLANT ENGINEERING

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Accident Data Article

(From preceding page)

outlined in the article only in certain minor respects. The most important of these in our choice of the 'base year' with which current accident experience is compared. We have suggested the previous year as a base, rather than some selected 'average' year, unless the previous year was considered a bad one from the safety standpoint. Our choice was made from practical, rather than theoretical considerations . . . The other changes, alterations of terms used for statistical concepts, were made to the same end of simplicity. We wished to avoid any confusion with the standardized Accident Frequency Rate . . . the chart and instructions will be printed in combined form for distribution to certain of our industrial risks."

Editor's Note: PLANT ENGINEERING is pleased to hear that the Insurance Group is using this article as a guide for setting up the Accident Control Chart. The editors are always glad to hear from the readers, commenting on articles—be it good or bad. Should you ever wish additional information on any article, or like to have an author's address, or want permission to use an article for company use or reference purposes, please let us hear from you. A letter or postcard is always welcome.

Plants Growing and Going Up

Whitney Chain Co. announces that construction is progressing rapidly on the new one story plant addition which will add approximately 10,000 sq ft of additional floor space . . . **General Electric Co.** is planning an expansion program of its silicone plant in Waterford, New York . . . **Sterling Electric Motors, Inc.** have constructed a new plant in Van Wert, Ohio . . . **National Container Corp.** has opened a new plant in Dallas, Texas, for the manufacture of corrugated shipping containers . . . **William F. Klemp Co.** has just completed an expansion program, including the addition of 50 per cent extra floor space at its Chicago plant . . . **Reliance Electric & Engineering Co.** has moved into its new plant in Euclid, Ohio.

CMP Regulation 5 Amended

CONTROLLED MATERIALS Plan Regulation 5, covering maintenance, repair, and operating supplies, installation, and minor capital additions, is amended as of December 20, 1951.

The amendments provide assistance to persons who require materials for installation and make other changes deemed necessary in the light of experience under the regulation. Accordingly, sections 1 to 11, sections 13, 14, 15 and 17, and Schedules I and II are amended.

The quotas established by this regulation, as amended December 20, 1951, shall apply to all operations beginning with the first calendar quarter of 1952.

Readers wishing a copy of this amended regulation should contact their local National Production Authority office, U. S. Department of Commerce, or write to U. S. Department of Commerce, National Production Authority, Washington, D. C.

'ROUND ABOUT

Industrial Ventilation Conference

A SHORT COURSE is being offered for plant engineers, contractors, consulting engineers and all others concerned with the design of industrial exhaust systems. This program will be held on the campus of Michigan State College, East Lansing, Michigan, February 25-28, 1952. Fee for the conference is $25.

There will be general sessions on various aspects of industrial ventilation, including such subjects as: "Principles of Hood Design," "Evaluation of Exhaust Systems," "Piping Design," and "Fans—Their Uses and Limitations."

Following each general session, those in attendance will divide into small groups where they will apply the principles discussed to an industrial problem of their choice.

For further information regarding this course, readers may write to Industrial Ventilation Conference, Continuing Education Service, Michigan State College, East Lansing, Michigan.

For Milwaukee Engineers

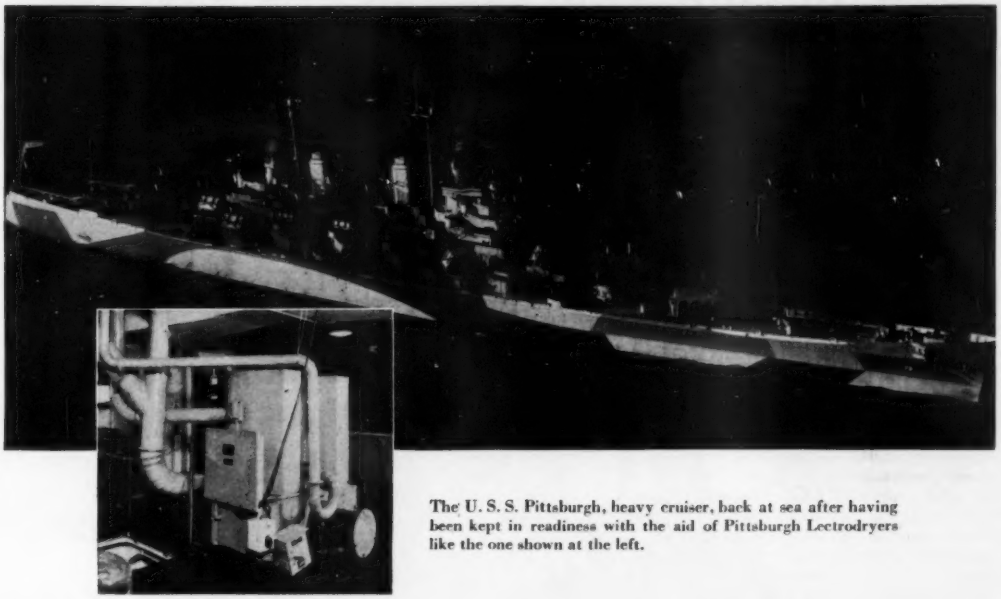
THE FEBRUARY meeting of the Electrical Maintenance Engineers of Milwaukee will be held on February 14th at their headquarters, 2540 North 30th St., Milwaukee 10, Wisconsin. A. Skretting, of Wisconsin Electric Power Co., Industrial Sales Div., will give a talk on the subject: "Line Voltage of Power Systems."

Personnel Changes at U. S. Steel

THREE PERSONNEL changes at Gary Sheet and Tin Mill Division of United States Steel Corp. were recently announced.

I. J. Paul was appointed tin mill division superintendent; **Robert W. Holman** replaces Mr. Paul as division superintendent of maintenance; and **Henry S. Gordon** replaces Mr. Holman as chief engineer. **Alfred T. Duff**, former division superintendent of the tin mill, has been transferred to the company's Fairless works.

Suppose YOU had to "warehouse" a 13,000-ton cruiser . . .



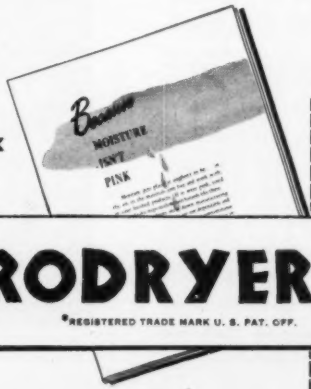
The U. S. S. Pittsburgh, heavy cruiser, back at sea after having been kept in readiness with the aid of Pittsburgh Lectrodryers like the one shown at the left.

The Navy did it by making the ship its own warehouse. In "Operation Mothball" the hull was sealed tight against outside moisture and the relative humidity maintained below 30% with the aid of Lectrodryers*. Now "Operation Zipper" has put the Pittsburgh back in service, its vitals rust-free and corrosion-free.

To warehouse safely any raw or finished products that WETth (unwanted moisture) would spoil, depend on Lectrodryers to DRY your storage-space air continuously, economically, automatically. Lectrodryer engineers will work with you to design your entire DRYing operation—including selection and installation of moisture-vapor barriers to control atmospheric WETth.

Where it's a problem of moisture in air under pressure, gases or organic liquids entering into your processes, there's a Lectrodryer to handle that job, too. Quite likely, the type of equipment you need is described in this free book.

MAIL THE COUPON FOR THIS FREE BOOK



LECTRODRYER

*REGISTERED TRADE MARK U. S. PAT. OFF.

Pittsburgh Lectrodryer Corporation
333 32nd Street, Pittsburgh 30, Pa.

Send "Because Moisture Isn't Pink" to

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Title_____

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You Can Do The Work of 3 to 5 Conventional Trucks With Only One ———

DEMPSTER DUMPSTER
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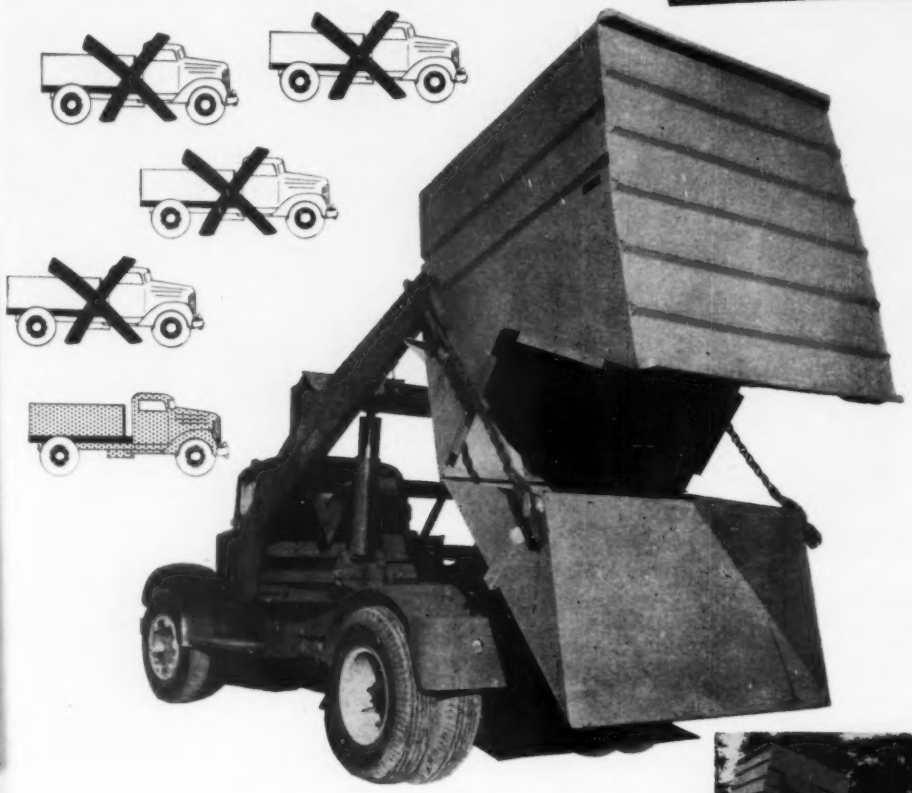
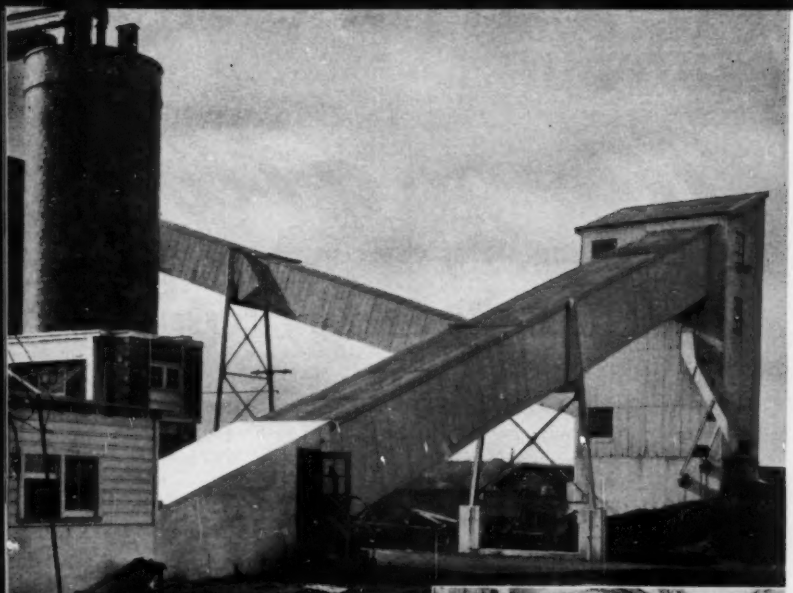
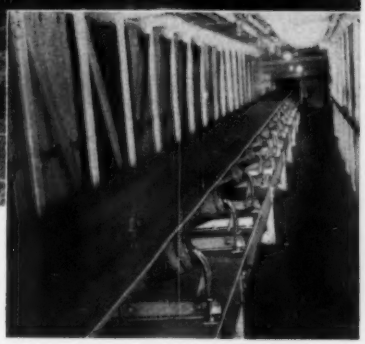


In many plants handling materials by the Dempster-Dumpster System, one truck-mounted Dempster-Dumpster, operated by only one man, the driver, has replaced 3 to 5 conventional trucks and crews. One Dempster-Dumpster services a multiple number of detachable containers in a wide variety of designs best suited to the type of materials handled—be they bulky, light or heavy . . . solids or liquids . . . trash or rubbish. Containers are conveniently located at accumulation points inside and outside buildings. The Type LFW Dempster-Dumpster shown above handles containers up to 12 cu. yds. Containers up to 21 cu. yds. are available with our Type ARLF and DTLF Dempster-Dumpsters. Without question, the Dempster-Dumpster System is the most economical and most efficient method of plant materials handling by truck yet devised! Write today for complete information. Manufactured exclusively by Dempster Brothers, Inc.

DEMPSTER-DUMPSTER, operated by means of hydraulic controls in cab, picks up each container, hauls and empties it or sets load down intact.

DEMPSTER BROTHERS - 122 Shea Building - Knoxville 17, Tennessee





Starts fast at forty below...

This belt conveyor carries coal from railroad cars to overhead hoppers for a power company located in the northern part of the Midwest . . . so far north that temperatures frequently hit forty below zero. Starting the conveyor in that kind of weather meant lost time, wasted manpower. The bearing lubricant became so stiff that five or six men often were required to pull on the belt. Three hours a day frequently were lost in getting the unit in operation.

As many as a dozen conventional lubricants were tried without success before a change to STANOLITH Grease No. 42 was made on the recommendation of a Standard Oil lubrication specialist. None could match the ability of STANOLITH to provide easy starting at extreme low temperatures, and still maintain effective lubrication during high summer temperatures.

STANOLITH Greases are filling the bill in a wide range of industrial and processing applications because of their resistance to heat and to the washing action of water, and their ability to flow readily under wide variations in temperature. A Standard Oil lubrication specialist can help you take advantage of these special properties. A call to your local Standard Oil Company office is all that's necessary. Or write: Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANOLITH
TRADE MARK
Greases

What's your problem?

Meet R. R. Rowlands, of Standard's La Crosse office. He is the lubrication specialist who worked with this power company to find the right grease for an especially tough job. And as a result of his work, the company was able to save considerable time in the operation of a coal conveyor.

His on-the-job service is typical of that available to all midwest plants through a corps of such lubrication specialists. You can be sure that the specialist in your own area has both the practical experience and the training in a Standard Oil Lubrication Engineering School that will result in dependable, thorough assistance.

Why not call your local Standard Oil Company office today? Put a lubrication specialist to work on your problem now. When he calls, be sure to discuss the advantages and performance records of these outstanding products:

STANOIL Industrial Oils—This multi-purpose line of oils provides cleaner operation of hydraulic units, supplies effective lubrication in air compressors, gear cases, and circulating systems. One or two grades can replace a wide variety of special oils and lubricants.

CALUMET Viscous Lubricants—These greases strongly resist washing and throw-off. Their superior wetting ability affords better coating of open gears and chains, better internal lubrication of wire ropes.

STANDARD OIL COMPANY STANDARD *(Indiana)*

BENJAMIN

"Magna-Flo"

so complete, you can always obtain

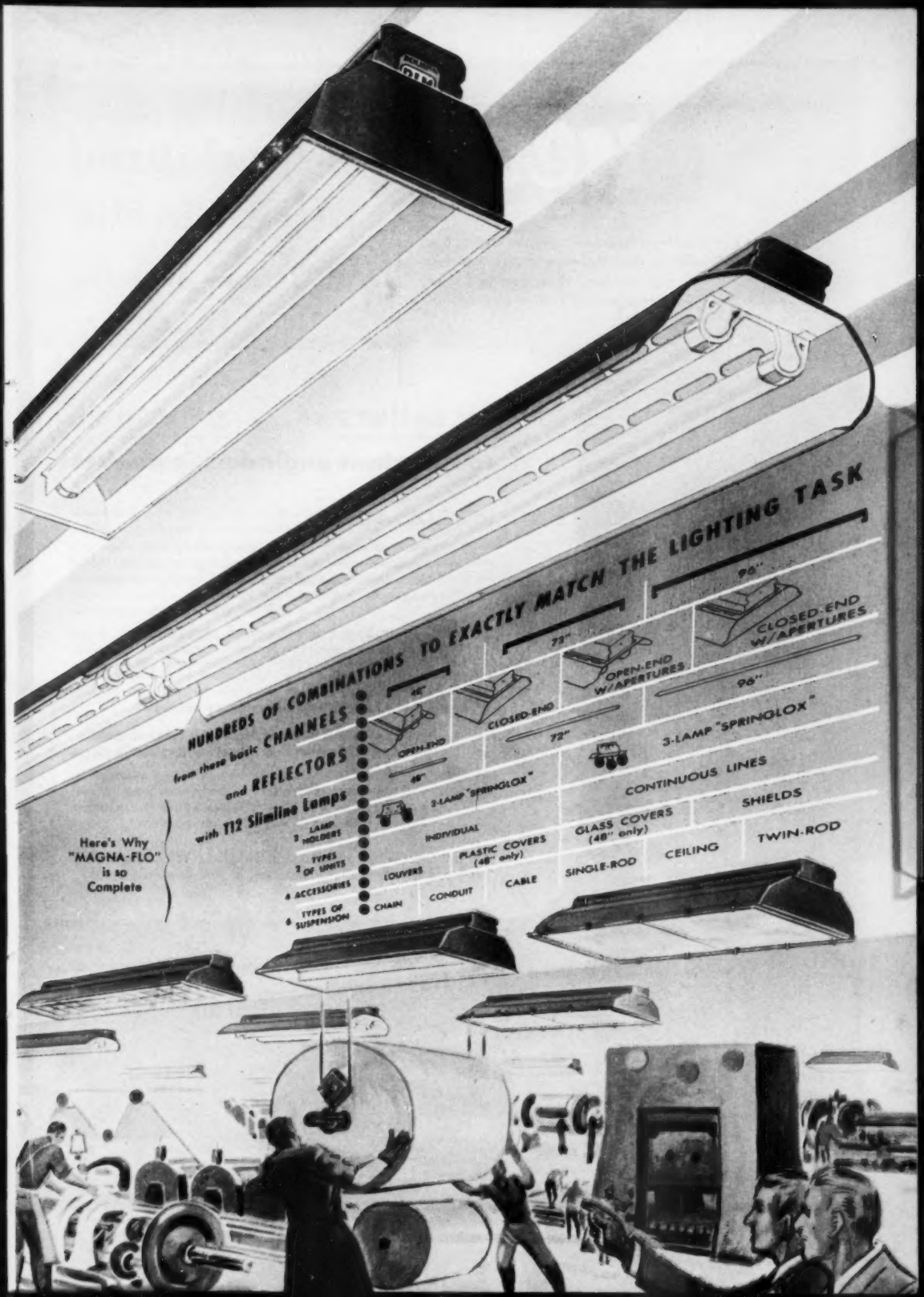
Task Matched Lighting Installations

To get all the extra lighting efficiency of the three new T12 Slimline Lamps, you need units that are MATCHED TO THE TASK—not substitute sizes and types, or a compromise on a "second choice." You get MATCHED TO THE TASK Units when you specify Benjamin "Magna-Flo" Fluorescent Lighting Units!

Like all Benjamin Lighting Systems, the "Magna-Flo" Line is complete! It is *so complete* because, basically, just three channel sizes and four types of reflectors form the backbone of an almost unlimited system to match any industrial lighting task!

High bays or low ceilings, moist or dirty locations, assembly lines or drafting tables, continuous-line lighting or individual units, lighting for inspection or mass production—whatever the seeing conditions and requirements of the task, you can get a "Magna-Flo" System that is MATCHED TO THE TASK because it is *so complete!* Further, in "Magna-Flo" Systems you get the most important features for sustained lighting performance and simplified maintenance, including exclusive Benjamin "Springlox" Lampholders for "easy-in, easy-out" lamp maintenance.

Write for Bulletin AD-5705 for complete specification data on Benjamin "Magna-Flo." Benjamin Electric Mfg. Co., Des Plaines, Ill. Dept. PE.


HUNDREDS OF COMBINATIONS TO EXACTLY MATCH THE LIGHTING TASK
from these basic CHANNELS and REFLECTORS with T12 Slimline Lamps
Here's Why "MAGNA-FLO" is so Complete
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2 TYPES OF UNITS
4 ACCESSORIES
4 TYPES OF SUSPENSION
48"
OPEN-END
CLOSED-END
73"
OPEN-END W/APERTURES
96"
CLOSED-END W/APERTURES
48"
2-LAMP "SPRINGLOX"
72"
3-LAMP "SPRINGLOX"
96"
INDIVIDUAL
CONTINUOUS LINES
LOUVERS
PLASTIC COVERS (48" only)
GLASS COVERS (48" only)
SHIELDS
CHAIN
CONDUIT
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SINGLE-ROD
CEILING
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new specialized buyers in the plant engineering market now available

These services are designed to make the buying and selling of materials and equipment faster and less costly, by means of improved techniques in the design and distribution of printed product information.

Fisher Governor Company

for sellers to the plant engineering market

If you need a new catalog—

you can have it expertly designed by men who have produced many outstanding catalogs for leading manufacturers whose products are bought by plant engineering men;

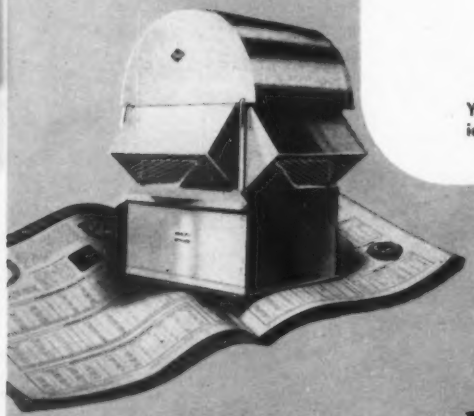
you can have it expertly printed, at moderate cost, by an organization which handles more manufacturers' catalogs than any other—in 1951, over *thirty-eight million* copies.

If you need effective distribution for your catalog—

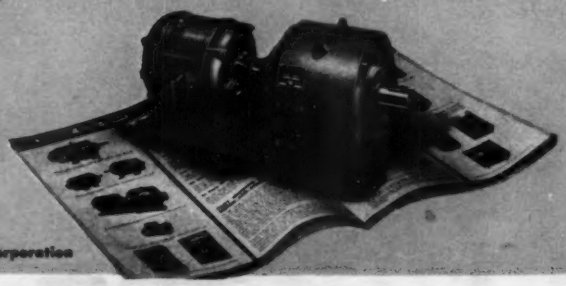
you can have it delivered to 30,000 selected specifiers and buyers of materials and equipment in 20,000 plants;

you can have it delivered in either of two ways—(1) by mail, or (2) pre-filed in PLANT ENGINEERING FILE, a bound, indexed collection of manufacturers' catalogs.

You can order these catalog design, production or distribution services separately, or in any combination, as your needs require.



ILG Electric Ventilating Co.



Wagner Electric Corporation

catalog services for sellers and PLANT ENGINEERING market

through Sweet's Catalog Service

for buyers

of materials and equipment

Many people on the buying side and on the selling side of the plant engineering market have expressed the need of a *pre-filed* catalog distribution service exclusively for this field. Therefore, Sweet's believes that most of the manufacturers who employ any of its services in connection with special catalogs for plant engineering men, will also choose to have Sweet's distribute those catalogs in pre-filed form, via PLANT ENGINEERING FILE.

So, whenever you need up-to-date buying information—

you will have a comprehensive file of catalogs of leading manufacturers, in bound form, in which you can readily compare types and makes and select the companies whose sales representatives you wish to see.

PLANT ENGINEERING FILE will contain information on materials and equipment used for:

air conditioning	instrumentation and control	plant maintenance	refrigeration
communication	lighting	power generation	safety
construction	lubrication	power application	sanitation
heating	materials handling	production	

Distribution of PLANT ENGINEERING FILE is scheduled for the fall of 1952. (Note: In the meantime, please refer to your current Sweet's File.)

The Cleveland Crane & Engineering Co.

The Ruberoid Co.

Sweet's has designed, produced and distributed catalogs for hundreds of manufacturers whose names are known throughout industry. All of this experience and Sweet's complete facilities will be used to get the right information on its clients' products in the hands of qualified plant engineering men.

Sweet's Catalog Service

Designers, Producers and Distributors of manufacturers' market-specialized catalogs

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Panel discussions on how casters help reduce the **"Reducible 30%"***

MATERIALS-HANDLING FORUM

Write us how you've used casters to solve specific handling problems. $25.00 will be paid for material used.

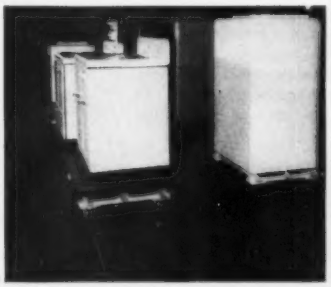
A SERIES PUBLISHED BY BASSICK, WORLD'S LARGEST MANUFACTURER OF CASTERS AND FLOOR PROTECTION EQUIPMENT

STRAIGHT-LINE EFFICIENCY COMBINED WITH FLEXIBILITY IN MODERN ASSEMBLY METHOD

Standard swivel and rigid casters with special wheels having a V-groove section cut in the tread for operation on track are basic to one of the most important materials-handling improvements of recent years, developed by Bassick.

First used by the aircraft industry in World War II, this method of speeding production and cutting costs has spread to the manufacture of automobile trucks, heavy-duty axles, bombs, machinery, food processing, and many other industries.

Grooved-wheels more practical than flanged wheels

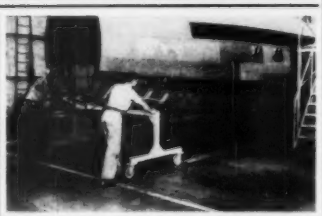


Besides being more economical, they can be used on or off the track.

The track system is extremely flexible, can be easily and inexpensively changed at any time or completely removed.

TRACK LAYOUTS CAN HANDLE EVERY OPERATING CONDITION

They can be easily and inexpensively re-arranged to handle simple or complex operations, using curves, switches, guide rails, etc. Fixtures, dollies, trucks, assembly stands, equipped with Bassick Position Locks, may be easily locked in one position or instantly released for movement.



Method ideal for loads of every weight

Various types of Bassick Casters are available with 4 in., 6 in., 8 in., 10 in. grooved wheels to handle loads up to 10,000 lbs. per caster.

Inverted angle iron track important element

Bassick Grooved-Wheel Casters operate on self-cleaning angle iron track, which is low cost, easily installed and can be laid wherever desired to utilize available working space to best advantage, without the restrictions of other conveying systems.

MAIN ADVANTAGES OF GROOVED-WHEEL ANGLE-TRACK METHOD

It controls movement by keeping all handling equipment in line in fixed position, and it makes movement 3-to-1 easier than flat wheels in direct contact with the floor.

Full details available upon request

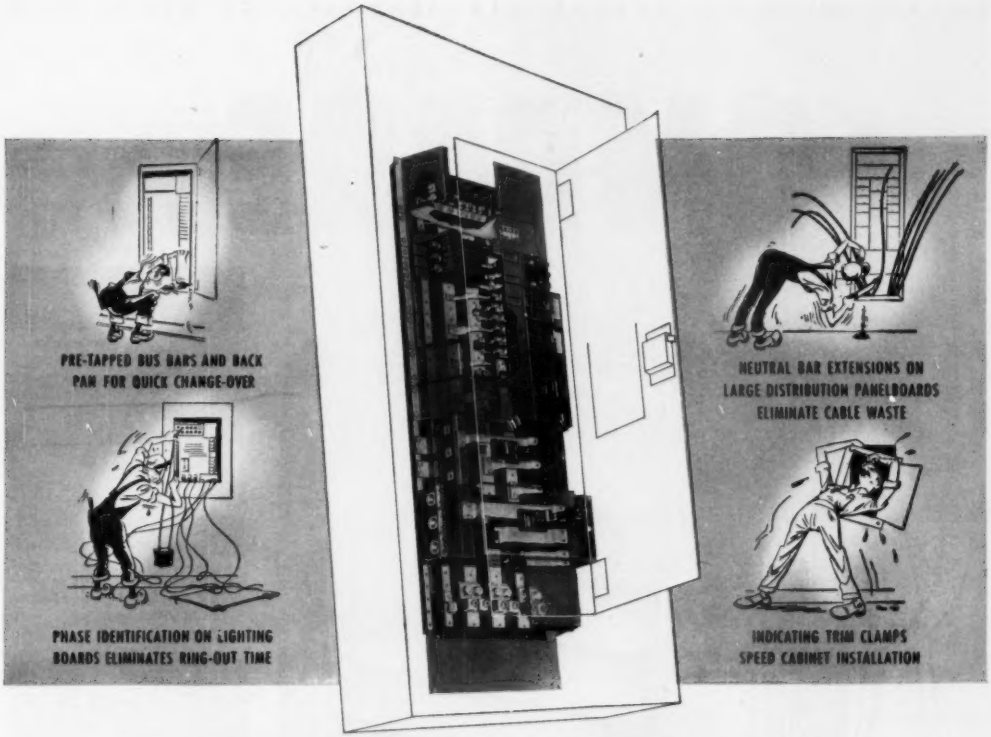
Write for Bassick booklet CW-49. Phone your local Bassick distributor. He'll be glad to help you and arrange for engineering assistance when desired. THE BASSICK COMPANY, Bridgeport 2, Conn. *In Canada:* Belleville, Ont.

*According to cost analysts, materials-handling (about 30% of total cost) affords about the only real opportunities for cost reduction today.

STEWART SW WARNER

Bassick

MAKING MORE KINDS OF CASTERS . . . MAKING CASTERS DO MORE


PRE-TAPPED BUS BARS AND BACK PAN FOR QUICK CHANGE-OVER
PHASE IDENTIFICATION ON LIGHTING BOARDS ELIMINATES RING-OUT TIME
NEUTRAL BAR EXTENSIONS ON LARGE DISTRIBUTION PANELBOARDS ELIMINATE CABLE WASTE
INDICATING TRIM CLAMPS SPEED CABINET INSTALLATION

Take an *EXTRA LOOK!*

for cost-saving extras provided by Westinghouse Panelboards

Fast installations cut panelboard costs. Fast conversions for changing or expanding power requirements cut costs. Recently a prominent trade publication stated that design—type and accessibility of connections, gutter and wiring space and other features—can influence panelboard installation time by as much as 25%.

Here are time-saving, cost-saving extras Westinghouse Panelboards give you:

1. Built-in Neutral Bar Extension on convertible distribution panelboards—eliminates dragging main feeders entire length of panelboard to reach neutral bar; now—locate all feeder terminal connections at same end of panel.
2. Pre-Tapped Bus Bars, back pan and other parts provide screw driver convertibility when needed.
3. Indicating Trim Clamps make it easy to get the trim on or off—eliminate guesswork.
4. Permanent Pre-phased Identification—letters at each breaker and main bus identify sequence of breaker and bus connections on 3-phase, 4-wire lighting panelboards.

Quick-fasten access plates, trim angle support, reinforced back pan, interchangeable parts are other advantages—extras at no extra cost—provided in Westinghouse Panelboards.

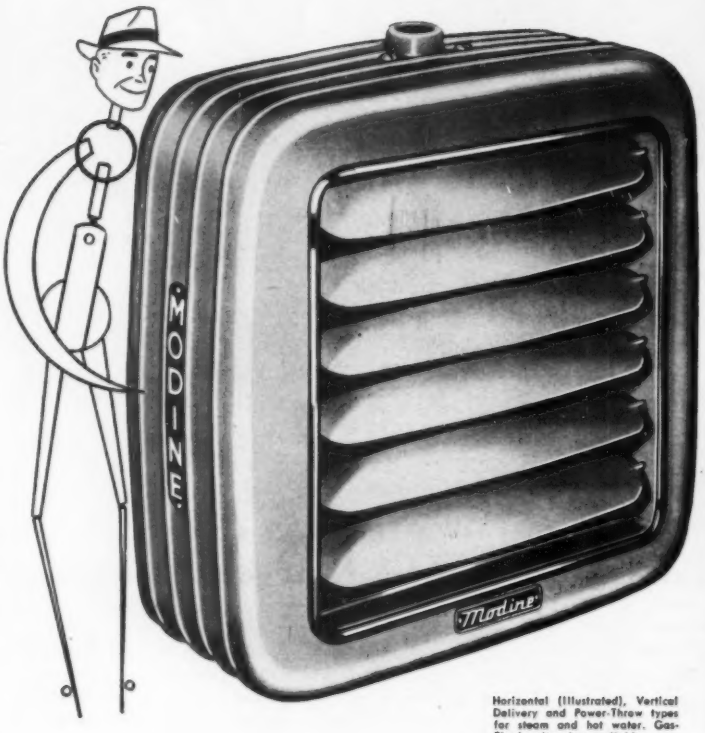
Contact your Westinghouse office or distributor. Or write for Descriptive Bulletin No. 30-930—Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-93466

YOU CAN BE SURE...IF IT'S Westinghouse

PANELBOARDS

ENGINEERS RATE MODINE THE STANDARD OF EXCELLENCE

COMPARE...



Horizontal (Illustrated), Vertical Delivery and Power-Throw types for steam and hot water. Gas-Fired units also available.

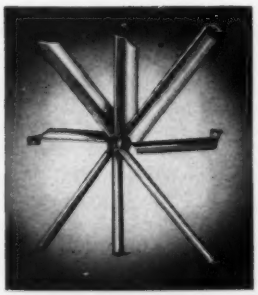
Discharge air temperatures of 110° -120° F are correctly related to air velocities—assure perfect heating comfort, lower fuel costs.

Direct-from-pipe suspension is safe and economical, with no hanger-rods. Heated air stream may be easily redirected over full 360°.

for comfort and economy Modine Unit Heaters top the field

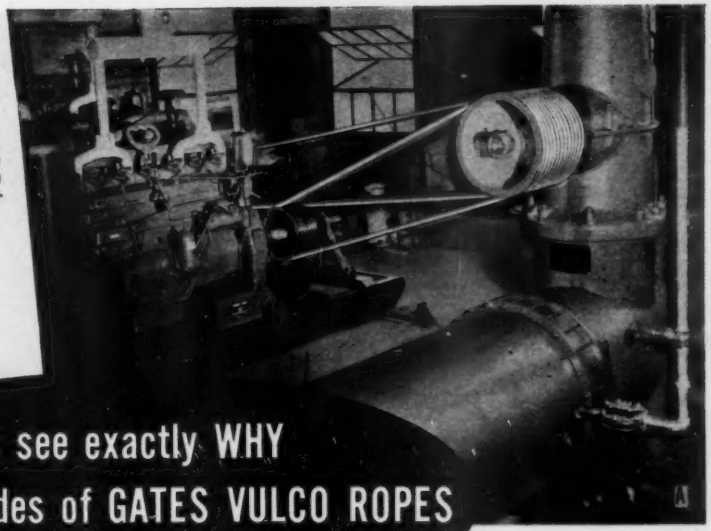
Yes, on every count, Modine Unit Heaters stand out. For balanced heating performance . . . for high fuel economy . . . for long years of trouble-free service—Modine is first choice of experienced heating men. *Compare*—you'll choose Modine every time. Modine Mfg. Co., 1563 DeKoven Ave., Racine, Wis.

Write for Bulletin 149-A, "Modine Unit Heating." Or contact your Modine representative listed in your classified phone book.



Built-in velocity generator effectively steps up heat throw. This assures positive heat penetration of cold air strata near the floor.

Modine UNIT HEATERS



To drive one of the new high capacity pumps which removes surface water and runoff from 15,000 acres of Illinois farmland, members of the District Board chose Gates Vulco Ropes, running from two diesel units.

Let's see exactly WHY the Concave Sides of GATES VULCO ROPES mean lower V-Belt Costs!

Every engineer knows how a V-belt *changes shape* when it bends around a pulley.

The top of the belt is under tension—making it grow *narrower.*

The body is under *compression,* causing the sides to bulge out!

Look at figure 1-A in the diagrams, herewith. There you see how a *straight sided* V-belt is forced to bulge in its sheave-groove—and this bulging naturally causes extra wear along the middle of the sides as indicated by the arrows.

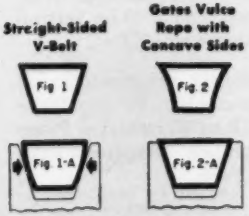
Now look at the figure 2-A. There you see how the precisely engineered Concave Sides fill out to an exact fit in the sheave groove.

Clearly, the Concave Sides press *evenly* against the V-pulley. This means uniform wear; longer life! The Concave Sides have *full traction;* wear longer because of *full contact!*

To sum up: The Concave Sides of Gates Vulco Ropes (U.S. Patent No. 1813698) give you (1) Less wear, (2) More pulley contact, (3) More sure power transmitted when needed!

Only V-belts made by Gates are built with concave sides. Whenever you buy V-Belts, be sure you get the V-Belt with the Concave Sides—The Gates Vulco Rope!

What Happens When a V-Belt Bends



How Straight-Sided V-Belt Bulges in Sheave-Groove. Sides Press Unevenly Against V-Pulley Causing Extra Wear At Point Shown by Arrows.

The Concave Sides Fill out to a Precise Fit in the Sheave Groove. No Side Bulge! Sides Press Evenly Against the V-Pulley—Uniform Wear—Longer Life!

CS-521

Gates

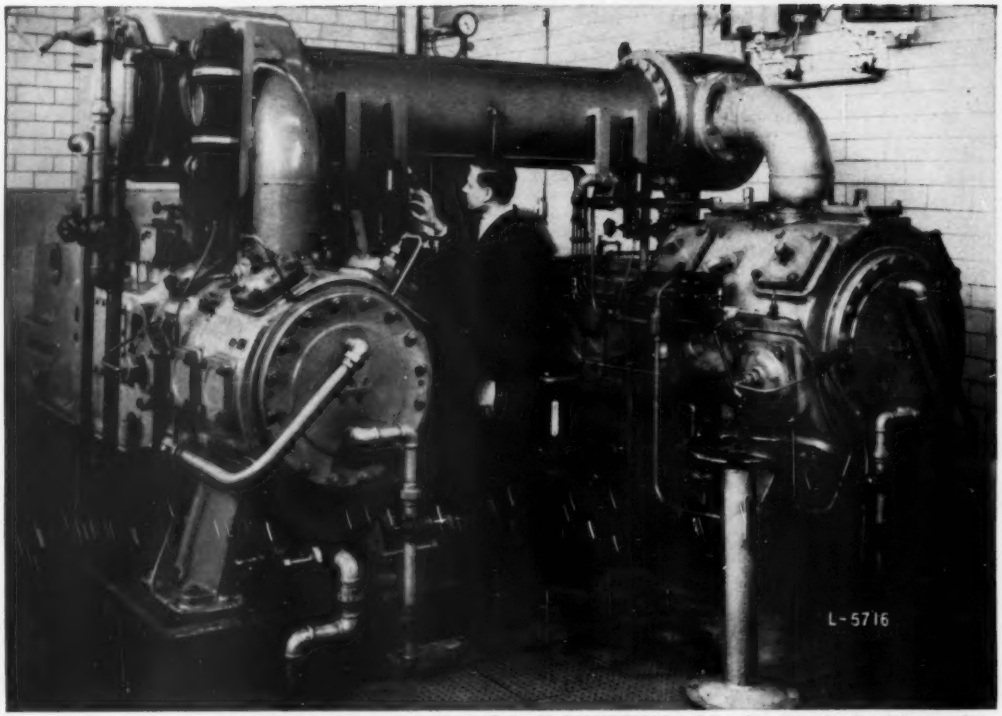
Hose · V-Belts
Molded Rubber Goods
for Industry

World's Largest Maker of V-Belts

VULCO ROPE DRIVES

ENGINEERING OFFICES AND JOBBER STOCKS IN ALL INDUSTRIAL CENTERS

THE GATES RUBBER COMPANY • DENVER • U•S•A



WORTHINGTON DC2 HORIZONTAL AIR COMPRESSOR at Jeffrey Manufacturing Co., Columbus, Ohio

Worthington air helps build Jeffrey mining and material handling equipment

This Jeffrey installation at Columbus, Ohio, typifies the best and most efficient in Compressed Air Equipment.

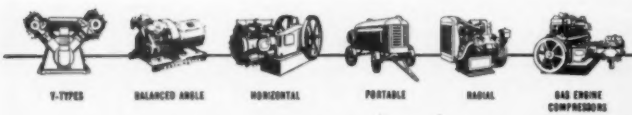
Equipped with Worthington's Five Step By-pass Capacity Control, the compressor requires *less* horsepower and *less* maintenance because of:

1. Reduced operating temperature at part loads.
2. Reduced part-load power consumption.
3. Reduced cylinder and ring wear because of improved lubrication.
4. Reduced carbon deposits on valves.

Jeffrey also operates a Worthington 350-hp steam driven compressor, a 10-hp single horizontal for soot-blowing, and a 10-hp vertical compressor for instrument air.

For dependable, efficient compressed air requirements, always specify Worthington. Write for Bulletin L-675-B1B to Worthington Pump and Machinery Corporation, Compressor Division, Buffalo 5, New York.

K.1.16



No Other Compressor Will Outperform a Worthington

WORTHINGTON

Compressors

Remember the trademarks "tt" and "TUBE-TURN" are applicable only to products of TUBE TURNS, INC.

Scrappy says, "Aid defense — more scrap today . . . more steel tomorrow."

Engineered to reduce pressure loss

Write Dept. D-1 for free booklet on Allowable Working Pressures. Use coupon on reverse side.

• Looks simple, doesn't it . . . that welding fitting? Not so! It's *engineered* . . . for shape, for size, for dimensions, for wall thickness . . . all so that it will do its share of the piping job for you . . . without trouble and at top efficiency. True circularity, smooth inner walls, and full radius combine to reduce pressure loss of any flow of fluid. Micrometer-checked uniform wall thickness and forged-in strength combine to assure long-life, dependable service.

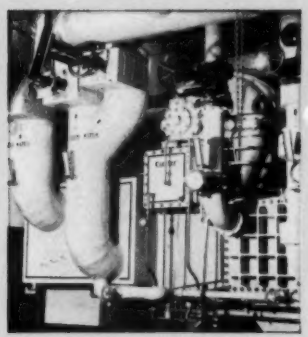
All TUBE-TURN Welding Fittings and Flanges are design *engineered* and held to extremely close manufacturing tolerances giving the utmost in strength, safety and efficiency. You'll find a TUBE TURNS' Distributor in every principal city. Call him for good service in good connections.

Be sure you see the double "tt"

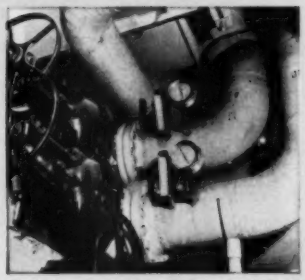
TUBE TURNS, INC. LOUISVILLE 1, KENTUCKY

DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Chicago • Houston • Tulsa • San Francisco • Los Angeles
TUBE TURNS OF CANADA LIMITED, CHATHAM, ONTARIO . . . A wholly owned subsidiary of TUBE TURNS, INC.

Welded piping reduces maintenance for City within a City



Piping for refrigeration machines, ranging up to 14 inches, is trouble-free. Use of TUBE-TURN Welding Fittings also speeded up erection of piping, since most assemblies were shop-welded, then tied into the systems they serve. Insulation was applied easily and is permanent.



District heating plant supplies steam at 150 psi. Steam is then sent through headers fabricated with TUBE-TURN Welding Fittings ranging up to 12 inches, and distributed via steam stations. Optimum flow conditions have been obtained and maintenance overhead minimized.

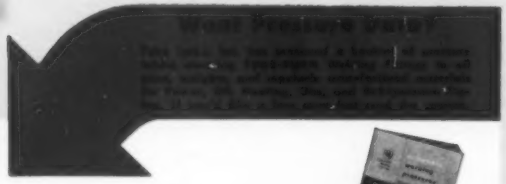
● Service requirements for the Rockefeller Center group of 15 skyscrapers add up to big figures.

The Center consumes nearly half a billion pounds of steam each year.

The famous outdoor skating rink is kept in use even when temperatures are in the high sixties.

A total of 8,000 tons of refrigeration is available for air conditioning.

But maintenance on all the miles of piping is kept to a minimum. All critical piping systems are welded, and directional changes made with TUBE-TURN Welding Fittings. Thus piping is permanent and leakproof, and vital services are maintained without interruption.



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224 East Broadway, Louisville 1, Kentucky

Your Name _____

Position _____

Company _____

Nature of Business _____

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City _____ *State* _____

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TUBE TURNS, INC.

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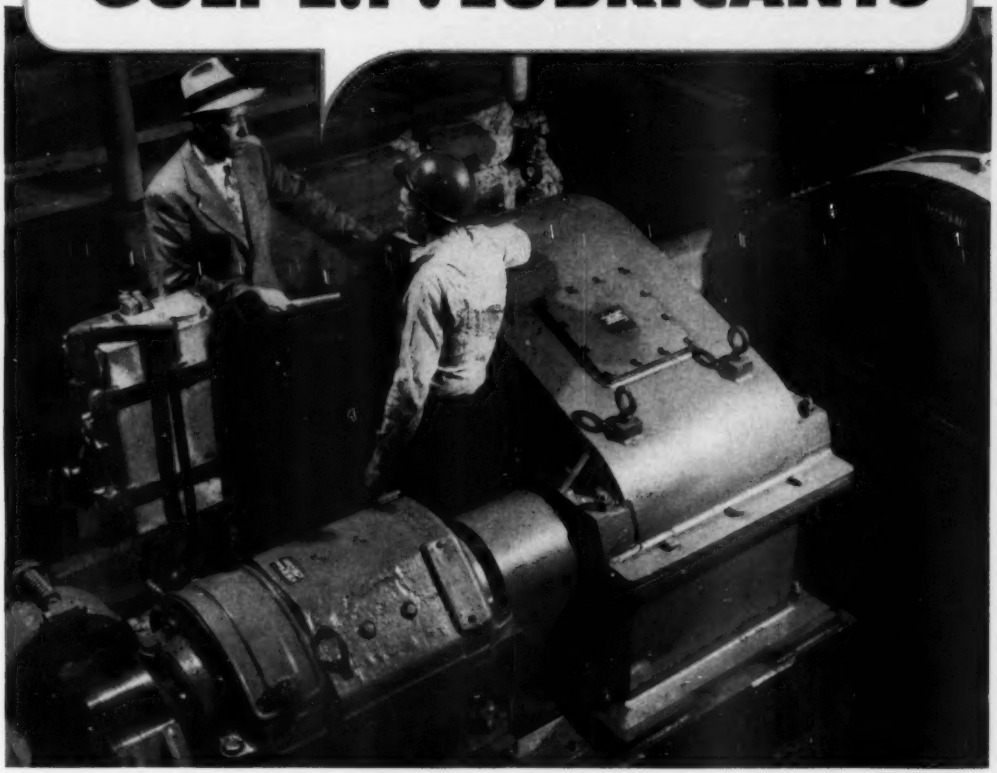
For better protection of gears and drives -GULF E.P. LUBRICANTS



All the desirable properties of extreme pressure lubricants are combined in Gulf E. P. Lubricants to insure longer gear and bearing life, and lower maintenance costs for most types of gear drives.

Gulf E. P. Lubricants are specially compounded to withstand the shock loads and high pressures encountered in the toughest service, but are equally effective for all types of industrial gears, including spur, helical, bevel, spiral, worm, and hypoid gears. They prevent metal-to-metal contact and excessive wear, keep maintenance costs low.

They are outstanding in their ability to separate from water. When the proper grade is used and good maintenance practice is employed, most lubrication difficulties caused by water can be avoided.

Other advantages: nonfoaming—saves loss of lubricant and mopping up; tenacious—minimizes throwoff; extremely stable for this type of lubricant; help prevent rust; and they are just as suitable for the lubrication of all types of bearings.

Gulf E. P. Lubricants are available in the proper viscosity for every gear requirement, ranging from 55 to 1050 S.U.V. at 210°F. For specific recommendations for your equipment, call in a Gulf Lubrication Engineer today. Write, wire, or phone your nearest Gulf office, or send the coupon below.

GULF INDUSTRIAL LUBRICATION

Gulf Oil Corporation · Gulf Refining Company PE
719 Gulf Building, Pittsburgh 30, Pa.

Please send me, without obligation, a copy of your pamphlet "Gulf E. P. Lubricants."

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Company.....

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Address.....

PLANT ENGINEERS' DIGEST so those who rush may read and know what's new

Gasoline Cutting Torch

THE SCRAP yard of the Worcester Works was a recent scene of the first public demonstration of a cutting torch using gasoline.

Gasoline atomized by oxygen resulted in a nozzle heat of 5500 F. The flame easily cut through a 2 in. laminated boiler plate and the rivet holding it, as well as a railroad rail, 4 in. rounds, 6 in. tie rods and axles, cast steel locomotive truck frames and wheels.

The two gallon tank of gasoline, weighing 23 lb when full, does cutting equivalent to a 240 cu ft cylinder of gaseous fuel. According to its inventor, J. A. Browning, a Dartmouth College instructor, the torch is safe and will cut costs. *From Wireco Life, published by the American Steel and Wire Co., Cleveland, Ohio.*

No Water Erosion Here But Useful Land Reclamation

HUNDREDS OF TONS of sand are used in Chevrolet's Saginaw Grey Iron Foundry operations. This sand has to be disposed of after use since it is no good for cores or molds again until it has been cleaned.

Cleaning it quickly by mechanical methods is very expensive so it has to be moved out of the foundry.

Pipes discharging "slurry" on public land marked for housing development

Conveyors move the sand to a central point. A strong magnet removes stray metal at this stage and the sand falls into a pump pit where it is mixed into a "slurry."

This soup-like slurry provides the easiest way of getting sand out of the plant. Six pumping stations supply a network of six miles of large size pipe, and it's through these that the slurry moves. Each minute 2,700 gal of water, 150 gal of sand and smaller amounts of dust go through the pumps. When the slurry slops out at the end of the disposal pipes, the sand settles first. Other particles settle out eventually and finally clear water runs into the Saginaw River.

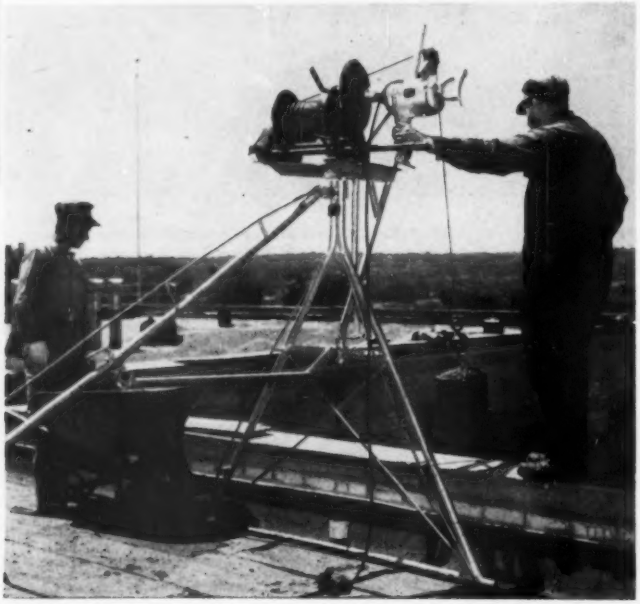
As a result, valueless marsh land has been built up into useful property. In addition some 500 tons of sand which the weather over a period of months has cleaned sufficiently for reuse in cores and molds go back into the plant each day. *From G. M. Folks, published by the General Motors Corp., Detroit, Michigan.*

Drill-Winch Combination Results in Hoisting Ease and Speed

ON A RECENT construction job in St. Paul, roofing material was hoisted to the roof of a two-story building not by back breaking hand labor but by a sound combination of equipment.

Hoisting the roofing materials was not a big enough job to warrant large hoisting equipment, but was tough labor by hand. So the roofing contractor mounted a Handiwinch on a hoisting frame and powered the unit with a portable electric drill, as shown.

As a result the portable hoisting unit moved bucketloads of gravel and other materials quickly and tirelessly. Comments of the workmen pointed out the advantages of speed, elimination of hand labor and ease of handling the rig. *From the American Crosby Clipper, published by the American Hoist and Derrick Co., St. Paul 1, Minn.*



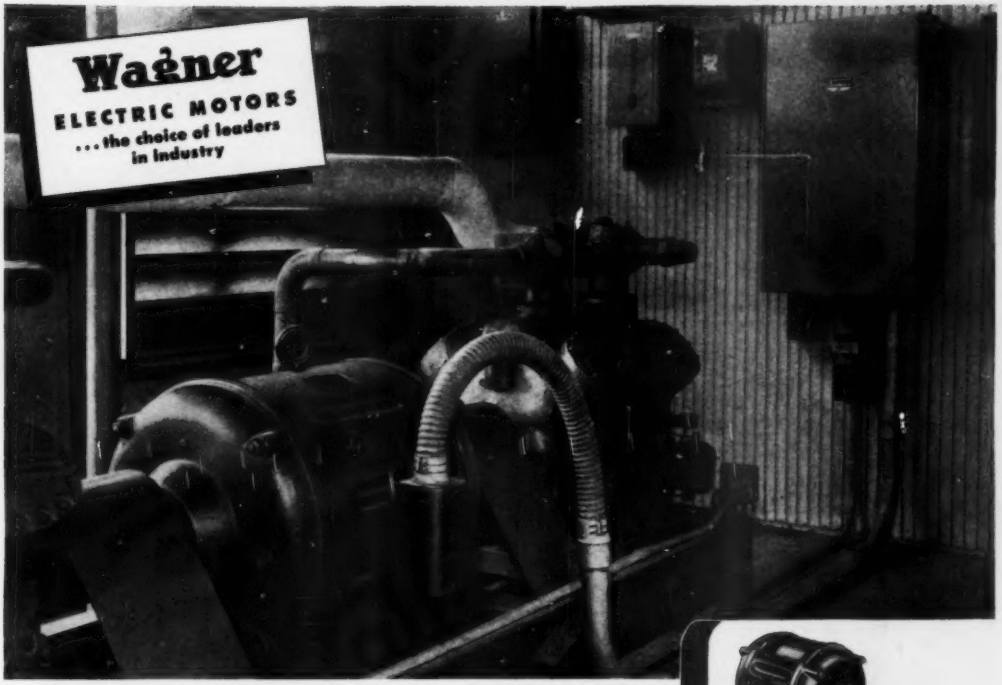
Hoisting equipment is shown on an actual job, raising a bucket of material. Power to motor is controlled by workman standing on top of building parapet

Pigs in a Basket Speed-up Airframe Tests

PIGS IN baskets, strangely enough, may be said to typify the techniques that are affording noteworthy economies these days in the structural testing of aircraft at Martin Company's Strawberry Point facility.

To simulate structural loads 20-lb lead pigs are placed in wire baskets. These can be readily disposed to mark the various combinations of localized loading called for in applying stress to the floor and frame of a fuselage.

Faced by the traditional chore of



Investigate the many advantages of using

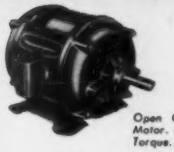
the Wagner Part-Winding Increment Motor and Starter Combination

The Wagner part-winding increment motor and starter combination provides an economical method of starting polyphase squirrel-cage motors when reduced current draw at start is required. No auto-transformers or resistors are necessary.

Wagner polyphase motors for part-winding starting, both normal and high torque, are wound with two circuits in parallel. The magnetic type increment starter has two magnetic contactors. When the first contactor closes, the line is connected to one group of the motor windings and a pneumatic timer is started. After the desired time interval, the pneumatic timer closes the second magnetic contactor which connects the line to the other part of the motor winding. Using this motor and starter combination, the current drawn from the line is about 60 percent of the normal locked current of the motor. It has the advantage that the current taken from the line is not broken during the starting period, as is the case when auto-transformers or compensator-type starters are used.

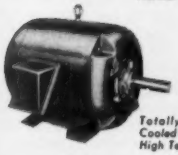
Motors with manual type starters are also available.

This magnetic part-winding increment starter can be furnished in combination with any of these Wagner Motors.



Open General Purpose Motor. Normal or High Torque.

Explosion-Proof Motor. Normal or High Torque.



Totally-Enclosed Fan-Cooled Motor. Normal or High Torque.

Splash-Proof Motor. Normal or High Torque.

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6492 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS – AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

Wagner Electric Corporation
EST. 1891

M12-8

placing these weights by hand, in a variety of patterns to fulfill each of the many test routines required in determining the structural strength of the fuselage, the engineers came up with the pig-in-a-basket idea. Now, instead of carefully placing the 50,000 lb of lead, by hand, 20 lb at a time, within the fuselage, the lead pigs are loaded in wire baskets to

Track dollies carrying pig loaded baskets are wheeled into the airframe

predetermined weights — then stacked and rolled in and out, to and from their proper stations, on tracks laid along the centerline of the fuselage.

Only half as many men are tied up in operating with the baskets, as would be called for if the weights had to be shifted about by hand. The floor-and-frame loading job, now normally accomplished in about ten days, would take so much time to perform by the manual shifting procedure as to be quite unacceptable under any modern, fast-moving program of airframe structural testing. *From The Martin Star, published by the Glenn L. Martin Co., Baltimore 3, Md.*

Trap That Unit Heater

INCREASED USAGE of the unit heater, to provide heat when and where it is needed, has precipitated the engineered application of steam traps to insure continuous heater operation. Traps maintain heater capacity by keeping the heater free of air and condensate, and forestall heater corrosion by removing from the heater the oxygen and carbon dioxide commonly found in steam.

The selection of the proper trap for the unit heater will require consideration of information obtained from manufacturers of both the heater and the trap. The application of the Btu output rating of the heater, or the weight of condensate produced against the published trap specifications and capacities will aid the plant engineer in his choice of equipment.

General recommendations for trap installation call for a safety factor of 3 to 1, to insure adequate trap capacity under severe operating conditions. The slightly higher cost of a larger trap will be more than offset by the complete coverage of the oversize trap.

Unit heaters should be individually trapped. Slight differences in entering air temperatures will cause unequal condensing rates. This inequality, in a multiple-heater, single-trap system, will block drainage from one or more of the heaters.

Failure or inefficiency of a unit heater may effect a large area or a large number of employees. Therefore, heater dependability, which stems from proper installation and trapping, is vital. *From the Armstrong Trap Magazine, a publication of the Armstrong Machine Works, Three Rivers, Mich.*

Overhead Piping Easily Insulated on Ground

APPLYING the insulation to exterior pipe runs presented an unusual problem at a large eastern power plant. The lines consisted of over a mile of fuel oil and steam tracer piping.

Half of these lines were to be suspended from hangers at the top of 25 ft poles and the remaining portion was to be run in underground trenches. To do a proper insulating job and to apply the protective coating after the insulated pipes were in final position would have been a difficult and costly job.

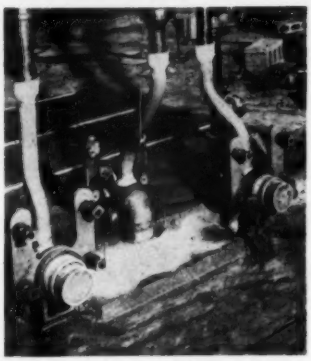
Workmen are applying insulation on piping which is then raised atop poles

As a solution, the piping was completely insulated on the ground and then either dropped into underground trenches in lengths of 150 to 200 ft or hoisted to the top of poles where it was installed on hangers erected for the piping. In this manner the extra expense and effort of insulating above or below ground level was eliminated. *From the Armstrong Insulator, a publication of Armstrong Cork Co., Lancaster, Pa.*

Wall-Hung Fixtures Make Floor Maintenance an Easy Job

ONE OF the most difficult problems in connection with public toilet rooms is the one of maintaining proper cleanliness. To a large degree conditions can be corrected by easing and simplifying the surface maintenance of such utilities.

Cleaning presents no problem when a wall-hung type of fixture is



Flexible bends fit through closet supports and are vented with lead pipe

used as the entire floor area is easily accessible to an ordinary floor mop. The floor itself is not likely to present areas through which seepage can occur inasmuch as there is no need for breaks in the continuity of the floor material.

Wall-hung fixtures, of course, present problems of installation that are not encountered with floor fixtures. Ample support of the wall-hung fixture is absolutely necessary and the piping connecting the fixture to the soil line must be flexible. The need for this flexibility is even more pronounced with wall-hung fixtures than with other fixture connections because of the greater rigidity with which they are held in place.

Lead bends providing the necessary flexibility for such type installations with flexible lead vent connections were installed in a large department store in St. Louis. The bends were caulked with lead into the horizontal cast iron soil line running under the concrete slab.

Manufacturer Saves $ $ $ on Glazing Replacement with PLEXIGLAS

The replacement of broken skylight glazing used to cost thousands of dollars a year at this Philadelphia industrial plant. Now they replace with *anti-breakage* PLEXIGLAS acrylic plastic. Money and maintenance time are saved. More daylight is admitted. The hazards of broken glazing are reduced to a minimum.

PLEXIGLAS—the *outdoor plastic*—is light in weight, resistant to weather and impact. It has the strength and resilience to withstand twisting when long transoms are raised and lowered, sudden changes in temperature, hard blows, and heavy wind and snow loads. It is easily installed, either as replacement or as initial glazing.

In addition to slashing replacement costs in high-breakage areas, PLEXIGLAS gives you better, more comfortable daylighting. White translucent PLEXIGLAS combines high transmission plus full, even diffusion of visible light, with low transmission of solar heat.

Have you a glazing problem? PLEXIGLAS, in flat or corrugated form, may solve it for you.

Skylight and transom glazing with heat-resistant PLEXIGLAS II at Crown Can Company plant, Philadelphia, Pa. Size of sheets: 28"x60"x.250", type C-2½ corrugation, white translucent color #2333-50.

Full details of PLEXIGLAS *for glazing will be sent on request. Write us for this booklet.*

CHEMICALS FOR INDUSTRY

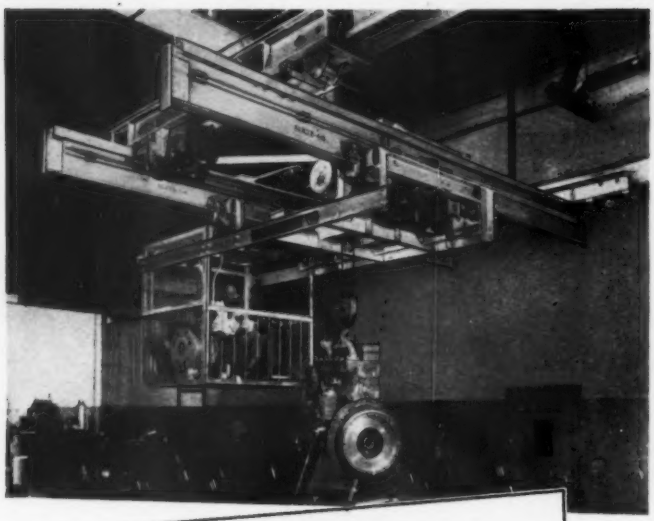
ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Representatives in principal foreign countries

Canadian Distributor:
Crystal Glass & Plastics, Ltd., 130 Queen's Quay at Jarvis Street, Toronto, Ontario, Canada

PLEXIGLAS *is a trade-mark Reg. U. S. Pat. Off. and in principal foreign countries.*



here's the crane for . . .

CONSTANT SERVICE at HIGH SPEED

If your handling operations must be "on the go—all the time—and fast" then investigate this American MonoRail Crane. With constant service at high speed, it offers the advantages of rugged construction, low-cost operation and quick installation.

The big reason is articulated trolleys. Each trolley wheel carries its share of the load in perfect alignment with the craneway tracks. All possible friction is eliminated. The result is perfectly articulated trolley travel. Articulated trolleys permit operating speeds of 500 feet per minute under constant service.

SEND FOR BULLETIN C-1

THE AMERICAN MONORAIL COMPANY

13123 ATHENS AVENUE • CLEVELAND 7, OHIO

Commercial castings made for this type of installation provided ample support for the fixtures. *From Lead, published by the Lead Industries Association, New York 17, N. Y.*

Bright Future For Stainless Paints

FLAKES OF stainless steel mixed with a suitable vehicle make a very desirable paint for certain electrical equipment. This type of paint is now a Westinghouse standard for transformers where a good appearing, gray, durable, matte finish is desired.

It is yet too early to make a full evaluation of stainless steel paint. It will probably have excellent resistance to certain types of corrosion. For example, stainless steel paint is able to withstand alkaline atmospheres which another type of pigment cannot. Hence, around plants making or using alkali, transformers and other equipment may be better protected with stainless steel pigments in the final coat. Such possibilities are being investigated.

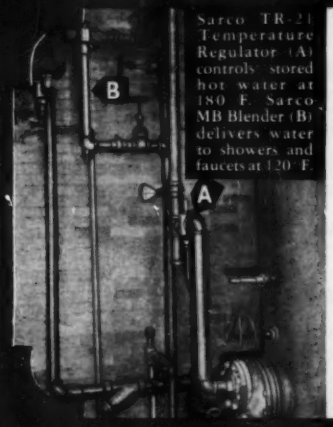
Stainless paint was applied to distribution transformers opposite a steel plant; the finish still looks perfect after a year and half exposure. It does not appear to show the color changes normally experienced in the chalking of standard outdoor gray finishes. *From a news release of the Westinghouse Electric Corp., Pittsburgh 30, Pa.*

Safe, Economical Electric Heat For Acetylene Generator Water

THE increasing use of acetylene gas in fabricating structural steel at the Ingalls Iron Works Co., Vernon, Pa., made it necessary for the company to increase its acetylene producing facilities. These were located in a small shed adjacent to the plant.

Water circulation heater is seen in pit. Thermostat in enclosure on wall completes circuit to heater when outside temperature drops to the freezing point

Don't Waste It



Sarco TR-21 Temperature Regulator (A) controls stored hot water at 180 F. Sarco MB Blender (B) delivers water to showers and faucets at 120 F.

In most plants and institutions hot water is stored for periodic use in process work, gang showers, group wash basins, etc.

Much of this water (often carried at 180 or 200° F) is wasted by allowing manual temperature adjustment at the point of use.

Avoid buying additional Water Heater capacity by installing Sarco Water Blenders.

Blend It

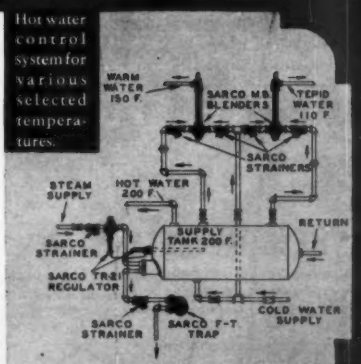
They add cold water to the hot from the storage heaters to secure the exact temperature desired at the point of use. In effect, storage capacity will be increased by preventing waste.

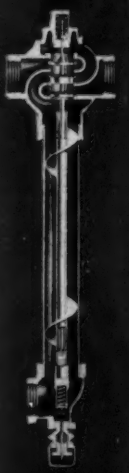
Catalog 802 tells the whole story.

Write for free copy today.

SARCO COMPANY, INC.
Empire State Building, New York 1, N. Y.
Represented in Principal Cities
Sarco Canada Ltd., Toronto 5, Ontario

Hot water control system for various selected temperatures.

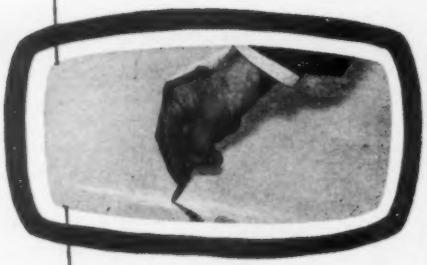




Sarco Water Blender type MB provides tempered water at any desired constant temperature.

Sarco Water Blenders

CAN YOU SCRATCH YOUR CONCRETE FLOORS?



With a nail or coin in your hand, you can easily scratch powdery fines from most concrete floors. Think of what the continuous grind of heavily-loaded traffic must do to the same surface. And once wear starts, impact is added to abrasion to accelerate deterioration.

BUT YOU CAN'T SCRATCH A DYNAPACT FLOOR!

The harder you try, the more you will burnish the surface of a DYNAPACT FLOOR. Its density and hardness is phenomenal as a result of materials and powered installation methods utilized for maximum wear resistance.

GET THE COMPLETE STORY . . .

Write today for your free copy of the DYNAPACT story, a complete, illustrated, step-by-step account of how to obtain a new order of performance for your flooring investment.

FLASH-STONE COMPANY
INCORPORATED
3723 pulaski avenue, philadelphia 40, pa.
industrial flooring specialists

The shed had to be heated to prevent the water used in the acetylene generators from freezing during cold weather. Heat for the building was supplied by a coal-fired heating plant. The presence of open flames presented a hazard since acetylene gas is highly explosive. In addition, labor and fuel costs for operating the boiler plant were excessive.

In order to accommodate the larger acetylene producing facilities and to remove the fire hazard, the company constructed a new fireproof concrete block building which is heated electrically.

A small concrete vault was built in the ground outside the building to house the electric heater. This 12 kw unit heats water which is circulated through pipes installed on the walls inside the building. A thermostat makes the heating operation entirely automatic, providing good and economical protection with a minimum of supervision. *From Industrial Electric Topics, published by the Duquesne Light Co., Pittsburgh 19, Pa.*

Controls End High Suction Exhauster Motor Overheat

THE COST of unloading ships and barges by the most modern and rapid means can be computed in terms of dollars per minute. A savings of a few minutes at each unloading may permit the ship or barge to carry one more cargo during the shipping season.

That is the reason that shipowners and masters were complaining vigorously to the Portland, Oregon

Observer is seen reading the vacuum gauge; at his right is the butterfly valve and the actuating electric motor

Commission of Public Docks about the delays at one of their grain elevators. There the grain is unloaded from the ship holds by suction hoses; then it is carried to the receiver cyclone where the heavy grain goes to the bottom and the air out the top.

The delays were caused by the 200 horsepower motor's frequent overheating and opening of the elec-

W. J. BILL of DOW CHEMICAL SUBMITS WINNING IDEA IN CONTROL DERBY

Mr. W. J. Bill of Dow Chemica' Company, at Bay City, Michigan, writes in about an unusual system which has been devised for the evaporation of liquid chlorine. Mr. Bill won an award in the Honeywell Industrial Control Idea Derby for his report of the operation.

The simplicity of the system is its outstanding feature. Based on control of the pressure of the chlorine gas, it uses a bank of infra-red lamps to supply the heat required for evaporation. The chlorine gas line is connected to a 2,000-pound liquid chlorine delivery cylinder. A Honeywell *Pressuretrol* unit is installed in the gas line . . . and, through a relay, it turns on and off a bank of infra-red lamps which shine against the side of the cylinder.

The heat generated by the lamps evaporates the chlorine until it reaches a pressure of 50 psi, and then turns it off. As soon as the pressure drops a little, the lamps are turned on again. By setting the *Pressuretrol* unit for a small differential, the gas pressure can be closely controlled.

The system assures a constant supply of 50 psi chlorine gas . . . with an absolute minimum of trouble in changing cylinders and hooking up.

Honeywell *Pressuretrol* Unit

NEW NEWSPAPER HELPS PLANT ENGINEERS

Honeywell's Industrial Division now issues a periodic publication—*Industrial Control News*—which contains detailed information on many new and unusual applications for automatic controls throughout industry. In its pages, production and maintenance men tell how they are reducing costs and increasing operating efficiency on all types of equipment. According to a release from the company, anyone interested in industrial controls can contribute to *Industrial Control News* . . . and can receive copies . . . by sending name, company, title and address to MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Station 40, 4491 Wayne Ave., Philadelphia 44, Pa.

do you have an "IDEA" for the Honeywell Industrial Control IDEA DERBY?

Just send us a sketch and description of how a non-indicating control is now being used to help keep things running smoothly in your plant. Think about it! Then send it in! An impartial board of judges will rate it in terms of its importance to the maintenance of plant operations. You may win a Honeywell Electric Clock Thermostat or one of the other special awards. All material submitted becomes the property of MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4491 Wayne Ave., Philadelphia 44, Pa.

Win a HONEYWELL ELECTRIC CLOCK THERMOSTAT

MINNEAPOLIS **Honeywell**

First in Controls

HERE'S WHY

HERCULES FLATTENED STRAND IS 10% STRONGER

It Packs More Steel Than Any Other Construction

SEE the keystone shape of the strands? Notice how compactly they fit together? That's the answer. There is *more* steel and *less* fiber in HERCULES Flattened Strand than in any other wire rope construction of equal size. And if you specify wire rope core, you get *still* more strength—7½% more—in the same diameter. That extra strength is often mighty useful—safer, too.

SEE how smoothly it fits the sheaves? Not one—but *four* wires in *each* strand touch the groove. That gives *longer* life to the rope . . . longer life to the sheave, too, because Flattened Strand's smooth outer surface prevents corrugation. And it's Preformed for easy handling.

The Red Strand is always your assurance of wire rope made of the finest steel and to the highest standards LESCHEN has developed in 95 years of rope making.

HERCULES RED STRAND

TOUGH ROPE FOR ROUGH JOBS

"Wire Rope Handbook"

tells why, and where Flattened Strand can best fit into your particular operation. Write for Booklet J-2.

LESCHEN WIRE ROPE

Consult our Engineering Department for specific recommendations. A. LESCHEN & SONS ROPE CO., 5909 Kennerly Ave., St. Louis 12, Missouri. Distributors in all principal cities.

trical protective overload devices. The overloading of the motor was caused by abnormally high suctions as a result of careless handling of the nozzles and suction hoses.

To overcome the undesirable conditions: A 6 in. butterfly valve is located at the intake of the exhauster (i. e. well behind the area carrying grain) to admit atmospheric pressure to the system to compensate for plugged hoses and nozzles.

The valve is operated by a Honeywell Modutrol motor of the proportioning type. The motor is controlled, through suitable relays by a Pressuretrol unit, also of the proportioning type, connected to sense the pressure in the receiver cyclone. The amount of vacuum, and thereby the load on the motor, and the maximum movement of the grain, is now predetermined and fixed. *From Industrial Control News, published by the Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.*

Ventilated Fixtures Stay Cleaner

THREE HIGH-BAY aluminum reflectors were installed in a weld shop and remained in an atmosphere subject to welding fumes for a period of about a year.

No provision was made to ventilate one of the fixtures. As a result it looked like someone put a coating of lampblack on its inside surface. This was a normal accumulation of dirt under the test conditions. Less

One year veterans of dirt collecting campaign in a weld shop. High-bay fixtures from left to right are: non-ventilated, ventilated through drill holes and ventilated by socket housing slots

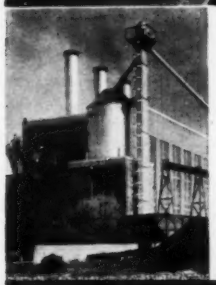
dirt was evident in the fixture in which 1 in. ventilating holes were drilled near the socket. The least amount of dirt was deposited in the fixture made with ventilating holes in the socket housing.

Moral: Ventilate your fixtures and they'll stay cleaner longer . . . without washing. *From See Better-Work Better bulletin published by the Lamp Div., Gen. Electric Co., Cleveland, Ohio.*

Routing Form Simplifies Machining Operations

MACHINING operations at the Allison Division plant of the General Motors Corp. are being simplified as a result of a suggestion submitted by Joe Penn, one of the employees.

MOVING SOMETHING* from HERE



The other day someone asked us what Jeffrey did. Quick as a flash we said: "If you have something to move from here to there, we can do it." Yes, and all sorts of devices with which to do it. Besides, we can process it (cool, dry, screen, feed, pack and elevate it) . . . reduce it, if necessary, to desired fineness so that something else may be done with it.

Material handling, processing and reducing . . . that's our business. That's where we can be of real service to you. Jeffrey builds many types of conveyors —some that cannot be found elsewhere—bucket elevators, feeders, packers, dryers, coolers, screens, bin valves, chains of all kinds, crushers and pulverizers, car pullers, transmission machinery, etc.

Our engineers know a great deal about modern material handling methods and reduction machinery . . . know how to fit them into your plant layout to provide fast, straight-line production . . . more profit for you. Convey your problem to them and let them give you a lift.

** SOMETHING takes in a lot of territory. But Jeffrey has a diversified line just as there are many kinds of material. Whether it's loose bulk or packaged, we can speed it on its way—at minimum cost and to your complete satisfaction.*

to HERE

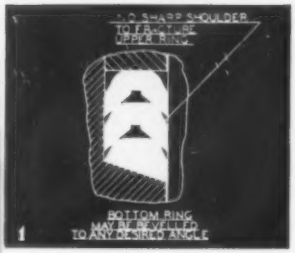
THE JEFFREY MANUFACTURING COMPANY

ESTABLISHED 1877

Complete Line of Material Handling, Processing and Mining Equipment

CHESTERTON PARACHUTE PACKING

REQUIRES NO GLAND PRESSURE



These four figures show the complete operation of CHESTERTON Parachute Style "600" Automatic self-setting packing. Figure 1, above, illustrates the overlapping individual sealing function of each ring, the flat top and straight sides. Note how bottom ring can be shaped to individual stuffing box.

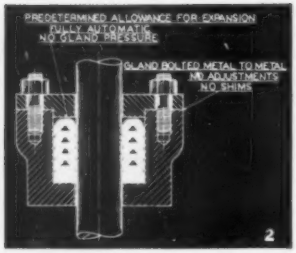
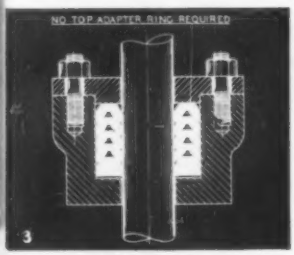


Figure 2, CHESTERTON Parachute Style "600" illustration shows proper clearance between gland follower and top ring. No gland pressure is required or desirable, as Parachute forms its own seal under pressure of medium packed.



In figure 3, CHESTERTON Parachute is illustrated under pressure. Packing has sealed automatically from pressure in force, and has moved to top of box where it is retained by gland lip.

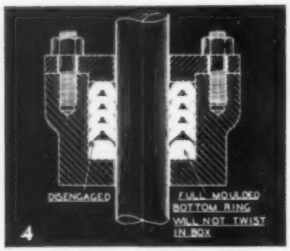


Figure 4 shows Parachute still under pressure; note that bottom non-sealing filler ring with pilot sides has dropped to bottom of box when pressure is equalized. It will not turn in box when ram is lowered.

Each Parachute ring seals individually, and due to unique design has individual lubricating channel between each ring, which assures longer wear by reducing friction. CHESTERTON Parachute will give you an entirely new packing concept. Order today, specifying 600W for water, 600S for steam, 600HO for hot oil, 600CO for cold oil, or write for descriptive literature with complete ordering information.

Parachute is one of 111 outstanding CHESTERTON styles

PACKINGS

GASKETS

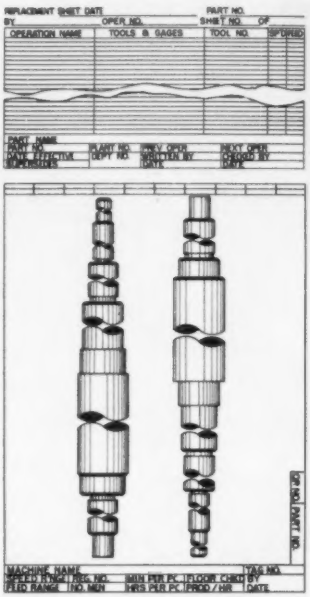
A. W. CHESTERTON CO.

Established 1884

6 ASHLAND STREET **EVERETT 49, MASS.**

His recommendation was that operational drawings be made for each machine operation of all parts requiring machining, the drawing to be a part of the routing.

The process man determines what views of the part are needed to illustrate all the machining operations. These views are drawn on a



This routing form shown in two parts is a time saver on machining operations. In use, the upper portion is located at the right hand side of the part sketch

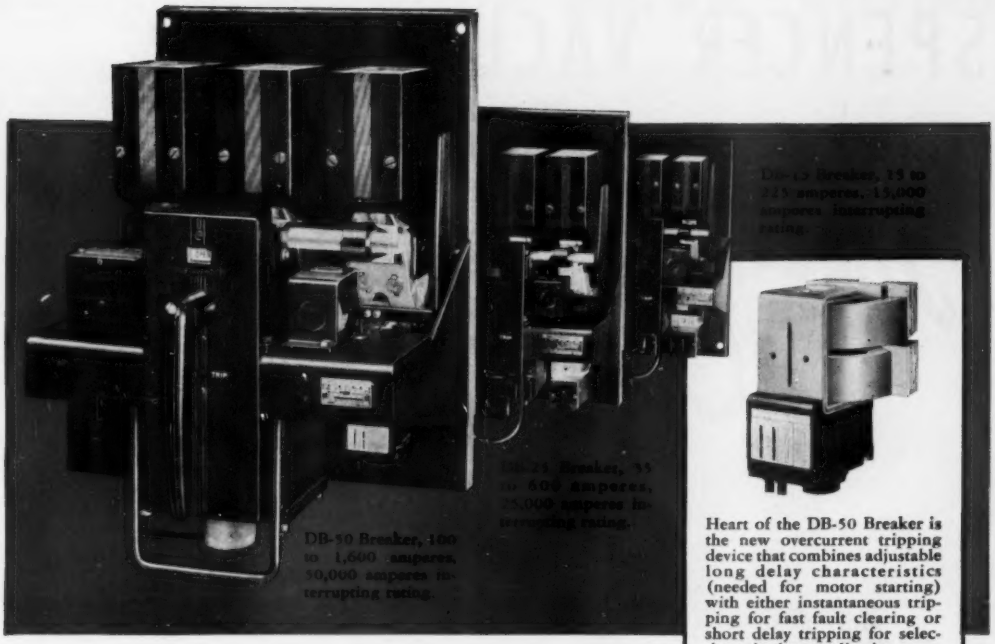
printed tracing form, which is the master sheet, from which sufficient transparent ozalid prints are then made for the necessary sheets.

Heavy lines on the surface to be machined are drawn by the process man who also adds the process dimensions. He also designates the location points and frequently the clamping points. The process man also sets in the sequence of the operation elements, lists the tools and gages, as well as all other pertinent information.

The use of the routings has effected the following savings: Time is saved in tool design, tool tryout, set-up and process inspection. The quality of the product is better controlled at each step of the processing, thus eliminating scrap. *From the Allisonews, published by the Allison Div. of General Motors Corp., Indianapolis 6, Indiana.*

Glass Paper

PAPER COMPOSED entirely of glass fibers, with no additive, has been made for the first time at the National Bureau of Standards in co-



DB-50 Breaker, 100 to 1,600 amperes, 50,000 amperes interrupting rating.

Heart of the DB-50 Breaker is the new overcurrent tripping device that combines adjustable long delay characteristics (needed for motor starting) with either instantaneous tripping for fast fault clearing or short delay tripping for selective tripping applications.

Now...15,000, 25,000, 50,000 amp.* Breakers *in a UNIFORM DESIGN!*

The new DB-50—most recent addition to the DB line of low-voltage breakers—extends the range of interrupting ratings to 50,000 amperes, continuous current ratings to 1,600 amperes. The co-ordinated design provides uniformity in construction features and operating characteristics, plus a completely flexible overcurrent tripping device.

The ability to close and latch on fault current is the latest and most severe requirement of a modern breaker. This requirement results from delayed tripping schemes designed to provide selective operation. Closely allied is the additional requirement of ability to carry, for periods up to 30 cycles, fault currents equal to the interrupting rating. Contacts, latching mechanism, and closing means of the uniformly-designed Westinghouse DB line of low-voltage air circuit breakers meet these rigid requirements.

The DB-50 has the same desirable unit construction as its smaller counterparts. It is this feature that allows you to add or remove any component as an assembled unit in the field.

Booklets B-4067 on the DB-15 and DB-25, and B-4740 on the DB-50 contain complete information. For copies, call your Westinghouse representative or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

See "Electrical Proving Ground" . . . *the dramatic story of the Westinghouse High Power Laboratory in sound and color motion picture. For details, see your Westinghouse representative or write Westinghouse Film Division, Box 868, Pittsburgh 30, Pennsylvania.* J-60748

*Interrupting Rating

DESIGN TESTED AND VERIFIED IN THE Westinghouse HIGH POWER LABORATORY

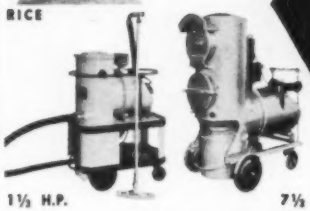
YOU CAN BE SURE... IF IT'S Westinghouse

"DE-ION" CIRCUIT BREAKERS

SPENCER VACUUM IN *Food and Chemical* INDUSTRIES

for CONVEYING · INSECT CONTROL · PACKAGING PRODUCTION · RECOVERY SANITATION

RICE



1½ H.P. 7½ H.P.

CHEMICALS

The time required for moving, cleaning, sorting and packaging valuable foods and chemicals has been materially reduced by Spencer Vacuum. Rice and powdered chemicals are handled by the ton. Excess powdered sugar is recovered from chocolate candies, the insect hazard removed at its source and the entire plant made continuously sanitary as an extra dividend, with the same Spencer machine.

Large areas, inaccessible spots in machines and tanks, above pipes and behind radiators are cleaned quickly with powerful vacuum tools. A Spencer size and vacuum tool for every purpose, including offices, boiler rooms and warehouses. Ask for the Bulletins.

427-A

THE SPENCER TURBINE COMPANY • HARTFORD 6, CONNECTICUT

SPENCER HARTFORD

operation with the Naval Research Laboratory.

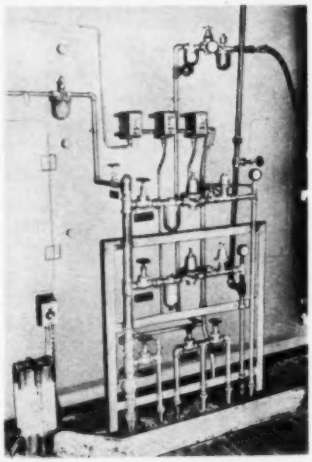
The raw material, commercially available fine glass fibers, was mixed with water and formed into continuous sheets on the semicommercial paper-making machine in the NBS experimental paper mill. A number of special problems had to be solved, however, before a paper of satisfactory strength and characteristics was obtained.

The all-glass paper has several important applications. It seems particularly valuable for gas masks and respirators used by fire fighters, industrial and medical workers, and military personnel. In gas mask tests only one smoke particle in 100,000 passed through the glass paper filter.

The excellent electrical characteristics of the paper should make it valuable as an insulator and dielectric. For instance, it can be used in oil-impregnated paper capacitors capable of operation even at temperatures above 200 C; suitable oils are available that withstand such temperatures. *From the Technical News Bulletin, a publication of the National Bureau of Standards, Washington 25, D. C.*

Air Control Panel Has Real Advantages

THE AIR CONTROL piping systems for presses in an auto manufacturing plant had always been a mixed ar-



This is a standard panel at one of the presses. A compact, easily accessible arrangement of equipment is shown

rangement and assortment of equipment. Because this condition existed, the company with the aid of our representative developed a standard piping system for all single, double and triple action presses.

Air pressure regulation is an im-

(Continued on page 40)

QUAKER *Production-eered** BELTING

CUTS "PILE-UPS" SAVES $400 A MONTH

QUAKER CONVEYOR BELTING

TINY LIVE RUBBER FINGERS GRIP CARTONS, STOP SLIPPAGE ON SLOPE OF 45°

High production, high efficiency . . . low cost, low maintenance. "Pile-ups" eliminated . , . dollars saved. That's the amazing success story of this rugged labor-saving Rough-Top Conveyor Belt "Production-eered" by Quaker for Doeskin, Inc., manufacturer of facial tissues.

Tiny rubber fingers grip each carton, hold it to the belt as it climbs this 45° incline — unattended — to the storeroom. By freeing one man per shift, whose job it was to free pile-ups, the company is saving some $400 a month

Just one more example of Quaker "Production-eering" at work. Let an experienced Quaker "Production-eer" — expert in applying industrial rubber products for improved production — help you boost production, cut costs with Quaker "Production-eered" hose, belting, packing and molded rubber products.

***Production-eering** — Every Quaker Industrial Rubber Product is "Production-eered" — engineered to provide maximum life, efficiency and production on each type of installation. All Quaker men — "Production-eers" of industrial rubber products — are ready to recommend the right rubber product for the right job. For timely production tips, get the new free booklet on Production-eering for Industry. Write today.

Get This Book ➡

QUAKER RUBBER CORPORATION

DIVISION OF H. K. PORTER COMPANY, INC.

PHILADELPHIA 24, PA. · BRANCHES IN PRINCIPAL CITIES

ANOTHER PLANT SAYS . . . GOODBYE TO

FUME PROBLEMS

ABOVE: Four Bifurcator Roof Ventilators installed at Winters & Crampton Corporation, Grandville, Michigan. LEFT: Inside the plant, showing plating-tanks and exhaust duct work leading to roof ventilators.

PROBLEM: To select the best way of exhausting corrosive fumes from tanks where refrigerator and stove hardware is plated.

SOLUTION: Four Bifurcator Roof Ventilators installed on roof with exhaust duct work leading to them from plating tanks.

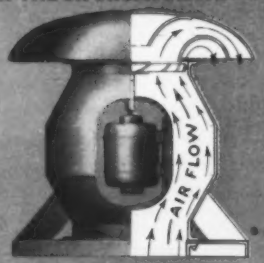
REASONS: "It was our choice to use this particular type of exhauster because of its simplified installation when compared to conventional centrifugal exhausters, which made it possible to omit elbows, sleeve band connections, discharge piping, and separate motor mounting and cover, which makes for a trim appearance. Ease of maintenance was also a consideration, as removal of weather top gives complete access to fan blade."

— Norman Davis, Plant Engineer
Winters & Crampton Corp.

RESULTS: "These four Bifurcator Roof Ventilators are doing a very satisfactory job of fume removal . . . performance is equal to, or in excess of, rated capacities."

— Norman Davis

HOW THE BIFURCATOR FAN WORKS



The DeBothezat Bifurcator is a direct motor-driven fan with a divided housing. Corrosive fumes are by-passed around the motor, which is mounted in a separate chamber, open to atmosphere but isolated from exhaust fumes. Bifurcator Roof Ventilators are equipped with weatherproof head and mounting base.

BIFURCATOR
ROOF VENTILATORS

FREE BULLETIN

"Design Data for Lateral Tank Ventilation." 32-page bulletin describes standard 2-sided tank exhaust, rear manifold exhaust and jet "push-pull" systems. Ask DeBothezat Fans representative for a copy or write our factory, Dept. PE-252.

DE BOTHEZAT FANS DIVISION

American Machine and Metals, Inc., East Moline, Illinois

BULLETINS just released and of immediate plant interest

INSTRUMENTS, CONTROLS

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140 **Tube Benders**—Bulletin 3901-A features a "2-in-1" bender which bends both ¼- and ⅜-in. OD tubing. Also gives data on other tubing service tools. Includes sizes, prices. The Imperial Brass Mfg. Co.

141 **Welding, Cutting Equipment**—Catalog 20-C, 64 pp, illustrated in color, gives complete information on company's welding and cutting apparatus through carefully planned pictures and charts to facilitate selection and ordering. A wide range of hose fittings, nozzles, controls, regulators, safety valves, other equipment included. Repair tools listed. Victor Equipment Co.

142 **Gas Cutter**—Illustrated Form AEC 972 contains detailed information on a

(Continued on page 135)

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138 Keep 'em Working!—Twelve-pp Bulletin 39 offers practical tips on care of high-cycle electric tools. Illustrated throughout, written in shirtsleeve English, covers all angles of tool maintenance from inspection periods to safety precautions. Discusses lubrication and correct amounts of grease, care of bearings, switches, cable, stators. Explains causes of overheating and touches upon power supply and wiring maintenance, shorts and grounds, fusing. The Rotor Tool Co.

139 What to Do About Coolant Oil Mist—Catalog E-50 illustrates and explains operating principle of manufacturer's oil mist precipitator, giving construction features. Various machine tool applications are listed, suggested methods of mounting are sketched, dimensions given. Trion, Inc.

140 Tube Benders—Bulletin 2681-A features a "3-in-1" bender which bends both ⅜- and ½-in. ID tubing. Also gives data on other tubing service tools. Includes sizes, prices. The Imperial Brass Mfg. Co.

141 Welding, Cutting Equipment—Catalog 20-O, 64 pp, illustrated in color, gives complete information on company's welding and cutting apparatus through carefully planned pictures and charts to facilitate selection and ordering. A wide range of hose fittings, hoses, controls, regulators, safety valves, other equipment included. Repair tools listed. Victor Equipment Co.

142 Gas Cutter—Illustrated Form ADC 673 contains detailed information on a

(Continued on page 136)

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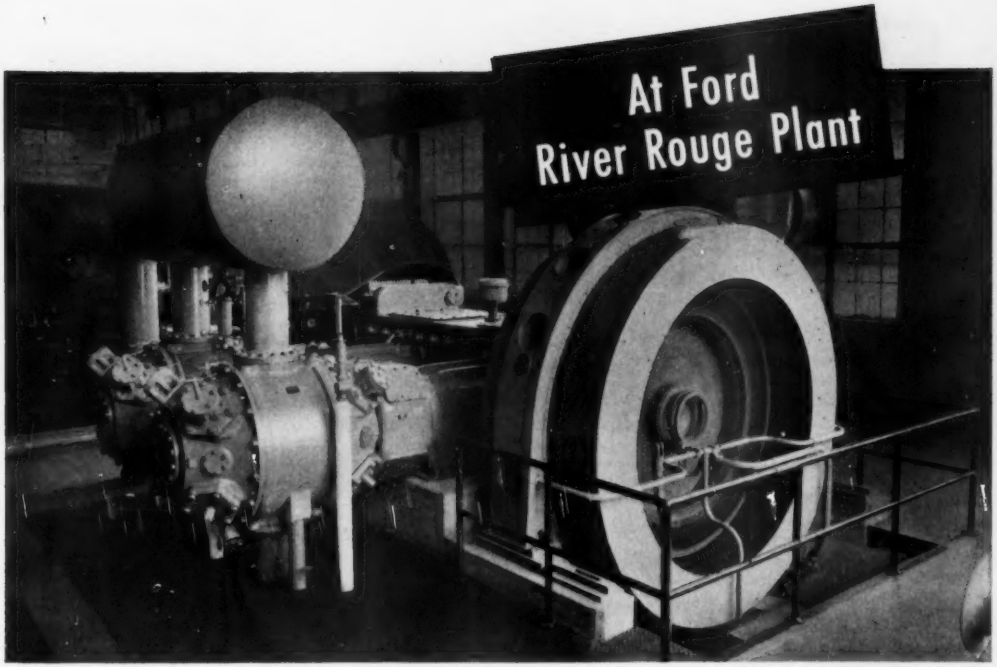

25% more compressed air ...half the floor space

This is the 2000 bhp Clark CBA-4, Balanced/Opposed, Motor-Driven Compressor of 10,000 cfm capacity which Ford Motor Company recently added to its River Rouge Plant. Duty: To shoulder the increased load requirements of its 105 psi air system network.

Aside from the fact that Ford is getting 25% more air out of this rugged Clark unit, in approximately one-half the floorspace required by any of the older units in service . . . besides the savings in time and manpower gained through simplified installation in *days* rather than *weeks*, Ford is on the "plus" side in many other important respects. Among them: Vibrationless operation, achieved by Clark Balanced/Opposed Design; simplified, reduced foundation requirements; inherent accessibility and marked simplicity of design.

Covering a range of 150-4500 bhp, the Clark Balanced/Opposed, Motor-Driven line is increasingly becoming industry's preference for plant air requirements. Complete details and literature are obtainable from your nearest Clark representative.

CLARK BROS. CO., INC.

One of the Dresser Industries

OLEAN, N. Y.

SEE the difference in . . .

CLARK

MIDGET ANGLE • RIGHT ANGLE • BIG ANGLE
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Balanced/Opposed COMPRESSORS

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How to measure a folding rule

Check every one of the features below before buying a folding rule. Then, compare a Stanley "Green End" with any other folding rule. See how much more real rule value there is in a rule that has "Green Ends". Famous Stanley "Zig-Zag", "Pull-Push" and Boxwood rules are available in a wide variety of styles, sizes and markings for every industrial need. Call your distributor.

No. 106 (6 ft.)

Easier Reading

Large black numerals and markings on white finish. Graduated in inches and 16ths on all edges for convenience.

Greater Accuracy

"Ball-socket" action locks joints, prevents "stretching or jack-knifing". Exceeds U. S. Govt. standards for accuracy.

Handy

Pocket-size. Opens as needed, up to 6'.

Longer Wearing

Rust-resistant nickel silver joints — longest wearing of any folding rule.
Protective plates on outside sticks.
New plastic coating on all sticks — wears four times longer.
Select rock maple sticks — tough and flexible.

Stanley Tools
New Britain, Conn.

Look for the famous "Green Ends" — your assurance of finest quality.

For inside or outside measuring . . .

No. 227 EXTENSION RULE 6 FT.

All the famous "Green End" features plus a 6" solid brass extension for quick, easy, inside or outside measuring. Extra thick sticks.

THE TOOL BOX OF THE WORLD

STANLEY

Reg. U.S. Pat. Off.

HARDWARE • TOOLS • ELECTRIC TOOLS • STEEL STRAPPING • STEEL

(Continued from page 34)

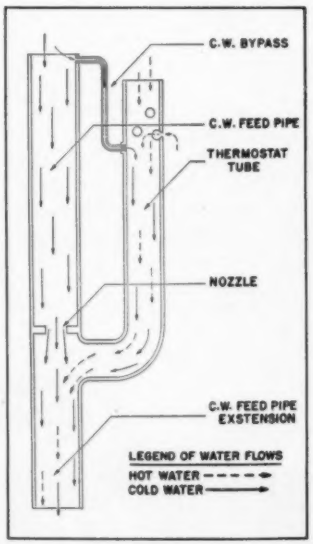
portant factor in big press operation in this plant. The brake, clutch, pressure cylinders, counter balance cylinders "iron hands," (a mechanical device for automatically removing stampings from the press), and die grinding tools are all air operated. To promote dependable operation such items as regulators, relief valves, lubricators and filters were incorporated in the system.

In standardizing on this air control panel the auto makers gained several noteworthy advantages: They simplified service operations, lowered maintenance costs, established uniformity of spare parts, reduced parts stock, and set a higher standard of press performance. *From Norgren Blueprints, a C. A. Norgren publication, Denver 2, Colo.*

Heating Unit Uses Compensator For Uniform Outlet Temperature

MAINTENANCE of uniform outlet temperature from a hot water heater is a factor that can be important depending upon the use of the hot water. Aerco engineers have developed a new system of hot and cold water mixing which is reported to result in a noteworthy improvement of temperature control.

The compensator (which includes a thermostatic element) is the outstanding feature of the heating system. The flow of cold water down the feed pipe of the compensator assembly (see sketch) induces circulation of the mixture of hot and



Circulation of a mixture of hot and cold water is induced by the flow of cold water past the feed pipe nozzle

NEW LOCK NO. 2, MONONGAHELA RIVER. First ship through on June 1, 1951 was U.S. Steel's "Homestead." A special feature of the lock is an emergency dam, at the upstream end, which can be raised or lowered as needed.

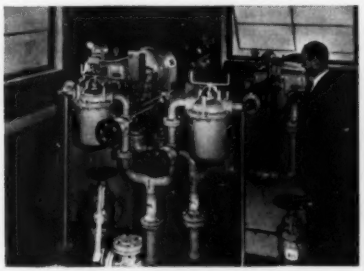
ENGINEERS PICK SUN HYDRAULIC OIL FOR NEW LOCK ON MONONGAHELA

Last year the Monongahela, busy river that flows past Pittsburgh's Golden Triangle, carried 2,000,000 more tons of shipping than the Panama Canal. This year its tonnage promises to be higher still, for on June 1 the U.S. Army Corps of Engineers put in operation their new Lock No. 2, near Braddock.

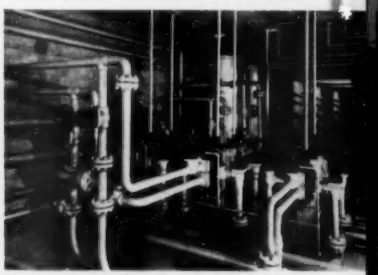
The entire mechanism of this lock . . . gates, butterfly valves, and capstans . . . operates hydraulically, and a Sun Hydraulic Oil was chosen as the medium. Why? Because this vital job required an oil that would prevent corrosion and rust; that would retain its original specifications for the life of the equipment; and that would flow freely at low temperatures, yet not thin out at high. The engineers in charge chose a Sun Hydraulic Oil over all other oils because they felt it could be best counted on to keep the lock in operation and river traffic moving.

For complete information on Sun Hydraulic Oils and recommendations as to their use in your operations, write for booklet PY-2.

HYDRAULIC CAPSTANS, operated by Sun Hydraulic Oil, are used when tows, too long for the locks, have to be broken up into units and pulled through mechanically.



SYSTEM'S HEART, operating the lock mechanisms, is a pair of Oilgear hydraulic pumps. They supply 2,800 gallons of Sun Hydraulic Oil at pressures up to 1,100 psi.



UNDERGROUND SYSTEM of pipe lines supplies all hydraulic devices. It is designed so that it will continue to function even though the chamber is completely flooded.

SUN INDUSTRIAL PRODUCTS

SUN OIL COMPANY, PHILADELPHIA 3, PA. • SUN OIL COMPANY, LTD., TORONTO AND MONTREAL

SUNOCO®

With This NEW Improvement Niagara "No-Frost Method" puts you a big step ahead in trouble-free, automatic refrigeration or freezing

Niagara "No-Frost Method" keeps frost and ice **COMPLETELY OUT** of your cooling, chilling, freezing or cold storage.

It uses Niagara No-Frost Liquid Spray to keep frost and ice from ever forming. It gives you, automatically, refrigeration with no defrosting, and full capacity **NEVER** cut down by ice building up progressively on refrigeration coils.

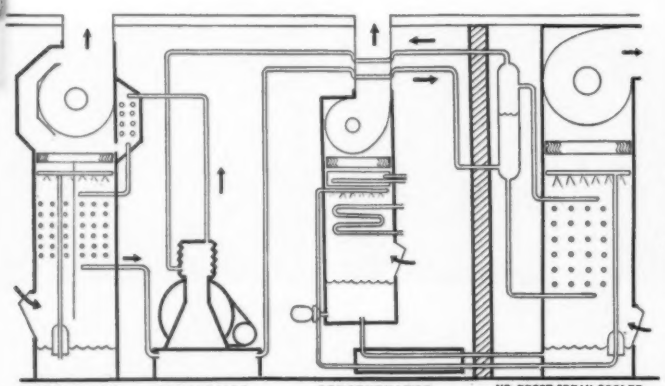
Now, a **NEW** design No-Frost Liquid concentrator, using a new principle, takes away moisture as fast as it is condensed by evaporating it at low temperature — not boiling it away at high temperature. It has 14 times the capacity of the old method per dollar of investment — one concentrator will handle a battery of high capacity spray coolers.

This gives you more refrigeration at lower cost; less machinery in less space. You operate at high suction pressure, saving power and wear and tear on compressors.

The extra capacity and lower cost both for equipment and operating makes this method advantageous for every type of refrigeration use — both for freezing and for moderate temperatures — for large "live" loads as in meat chilling or in fruit and vegetable pre-cooling — for rooms that are filled and emptied of product daily, such as milk rooms and terminal storage warehouses.

You get true trouble-free refrigeration . . . No brine . . . no salt solution . . . no dirt . . . no mess . . . It is entirely clean; you get rid of dirt and odors. You reduce both equipment and operating costs.

For complete information write to the Niagara Blower Company, Dept. PE, 402 Lexington Avenue, New York 17, New York.



A simple method, easily maintained. Saves a third of your refrigeration cost. Ask for Niagara Bulletins 118 and 119.

cold water down the thermostat tube.

This induced circulation is created by the cold water discharging through the nozzle of the compensator assembly. The hot water portion of the mixture is taken from the top of the heater while the cold water is taken from the feed pipe through the by-pass connection of the assembly. The induced circulation of hot and cold water mixture activates the regulator (steam valve) through the thermostatic element.

The temperature of the hot water being drawn into the compensator assembly is raised by steam in the coils. This raises the temperature of the mixture passing by the thermostatic element causing the regulator to throttle the steam flow to the coils, reducing the heat input and creating a balance. This balanced condition continues until disturbed by either a change in the flow rate or temperature of the incoming water. *From a bulletin released by the Aerco Corp., Englewood, N. J.*

Within These Vapor Limits Lie Violent Repercussions

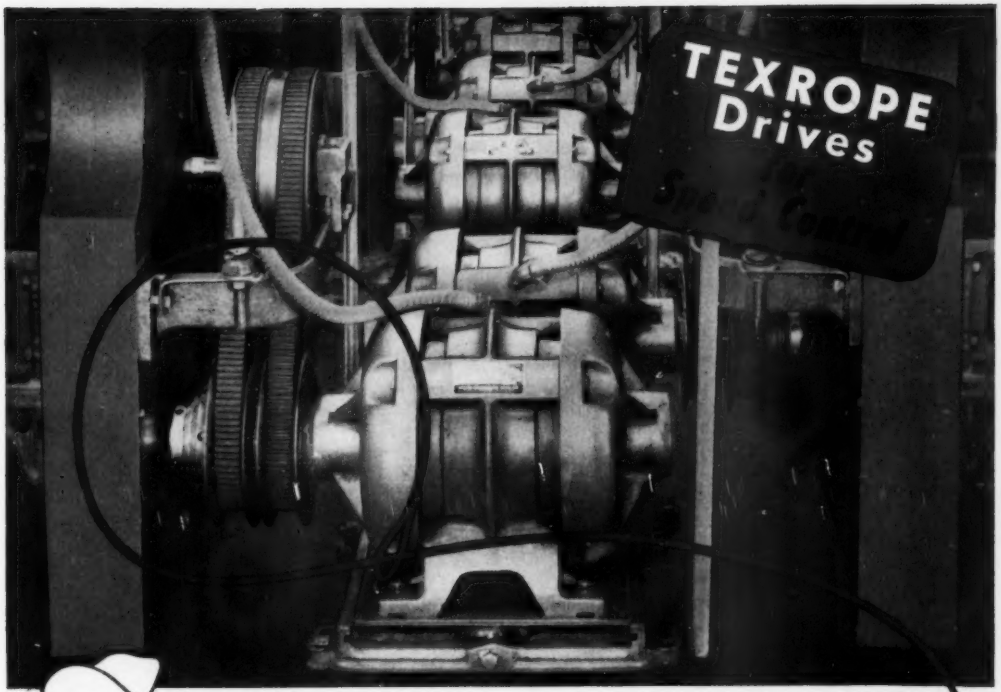
FLAMMABLE LIQUID vapor concentrations in air have high and low limits within which combustion throughout the mixture takes place. The "leanest" mixture that will burn is called the lower explosive limit. Its counterpart is the upper explosive limit above which flame propagation at room temperature will not occur because the mixture is too "rich" to burn.

A measure of the hazard of a liquid, its vapor or gas, is, therefore, the extent of this explosive range. A material with a wide range, such as acetylene (2.5 to 80 per cent by volume in air), is obviously subject to ignition in almost any concentration.

Flammable liquids with boiling point temperatures less than normal room temperatures can produce hazardous quantities of vapors without application of heat. Liquefied petroleum and some ethers are two substances that have this physical characteristic.

On the other hand, vapors from high boiling point liquids are not given off in sufficient quantities at room temperatures to create a flammable mixture. Fuel oils, for example, would fall in such a class. The degree to which a liquid may create a hazardous vapor concentration can also be measured by its flash point.

Fewer accidents, both inside and outside of industry would occur if the properties and behavior of flammable liquids were more generally understood. *From The Sentinel, a publication of Factory Insurance Association, Hartford 2, Conn.*



TEX SAYS: Speed Control Can Cost So Little USING VARI-PITCH DRIVES

ASK ABOUT *Vari-Pitch* drives! Whether you want to change speeds while your machine is in motion or stopped, there's a low cost *Vari-Pitch* drive for the job.

You'll find a *Vari-Pitch* sheave used with a standard motor can often give the same smooth, stepless speed control as a multi-speed motor or expensive control costing many times more.

For example, many textile mills are using *Vari-Pitch* sheaves to make the delicate speed adjustments they require when yarns are changed. This means mills can achieve a degree of modernization with this one low-cost changeover. Other industries are enjoying similar benefits.

It's especially low cost when you remember old motors need not be replaced by special motors or control. To get variable speed with *Vari-Pitch* drives, only the sheaves need be changed. Take a tip from these mill operators. Check into *Vari-Pitch* drives.

GO TO V-BELT DRIVE HEADQUARTERS — Allis-Chalmers has the widest range of variable speed drives in the industry. Moreover, you can be sure your job is figured right if you get your drive from Allis-Chalmers, for more industrial V-belt drives have been engineered by A-C than by any other company.

Call your nearby Allis-Chalmers distributor or district office, or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-3589

Texrope and Vari-Pitch are **Allis-Chalmers** *trademarks.*

Choose from These Types of Variable Speed Drives

***VARI-PITCH* SHEAVES** for A-B, B, C, D, and E belts — speed variation 15% to 25% per sheave. Capacities 1 to 125 hp. Stationary type — for changing speed when motor is stopped. Motion Control type — for changing speed when motor is running.

WIDE RANGE *VARI-PITCH* SHEAVES for Q or R wide belts provide up to 2 to 1 speed range . . . fractional to 40 hp. Available in Stationary Control and Automatic types.

***VARI-PITCH* SPEED CHANGER** — enclosed unit for adjusting speed while machine is in motion. Provides up to 3.75 to 1 speed range. Capacities 1 to 75 hp.

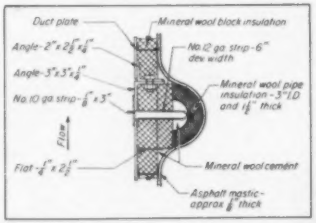
ALLIS-CHALMERS

Insulating Technique for Duct Expansion Joints

AN UNUSUAL application of mineral wool pipe insulation has been developed by engineers of the Riley Stoker Corp. to insulate expansion joints in gas and air ducts. The insulating technique, according to the Industrial Mineral Wool Institute, is designed for efficient, long-lasting service by minimizing the possibility of such maintenance headaches as surface cracks and hot spots which can waste both fuel and repair time.

In making the joint, the gap in the duct plate, approximately 4 in. wide, is covered by two iron angles welded to one side of the plate. A strip of 10-gage plate is welded to the other side of the duct gap. As the duct expands and contracts with temperature changes, sliding occurs between the top edge of the 10 gage strip and the 3x3x¼ in. angle.

A gas-tight expansion joint is insured by continuous seal welding circumferentially around the entire duct at all points of attachment. The ½ in. bolts secure the two angles together at 24 in. intervals except near the duct corners, where spacing is reduced to 3 in. The heart of the joint is two 6 in. strips of 12 gage sheet steel which are formed



Expansion joint cross section shows installation of metal seals and insulation across joint gap in hot air duct

and welded together at one end and, at the other end, to the respective edges of angle and duct.

Supported on blocks of mineral wool adjacent to the joint, standard pipe insulation, cemented in place, covers the welded joint of the two expansion leaves. A layer of asphalt mastic completes the installation.

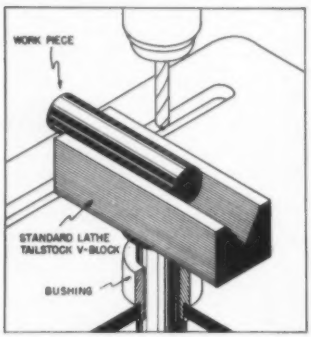
Centering Jig Simplifies Diameter Drilling

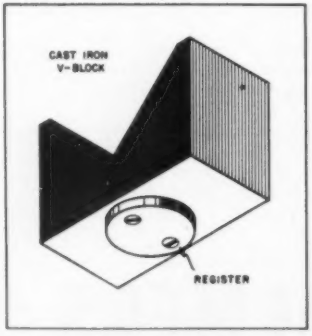
A READILY aligned centering device is obtained by adaptation of a lathe tailstock drilling pad for insertion in a drill press table. The drilling pad consists of a tapered shank with a V-block at right angles across the base of the taper, the center of the V coinciding with the axis of the shank.

A bushing bored to fit the shank taper and shouldered to partially slip into the center hole in the drill press table completes the assembly.

The use of the V-block in the center hole of the drill press table centers the work in respect to the table; a mark scribed on the press pillar and on the press table provides a quick method of centering the table in respect to the drill head.

For larger work, a V-block is fitted with a circular plate turned to the diameter of the press table center hole. The V-block is centered by fitting the circular plate into the hole in the drill press table. In both instances, horizontal support for long work pieces can be obtained by the use of matching V-blocks set flat on the press table.





Two applications of a V-block used as a work-centering jig on drill press table

Oven Dries Parts for Spraying

AN ELECTRIC infrared oven has replaced the hot air fans formerly used to dry tractor parts at Harry Ferguson, Inc., before spray painting. Substantial savings have been realized by conveyorizing the operation, which automatically dries widely varying part sizes and shapes.

The oven is in two halves, each containing 8 horizontal and 6 vertical Chromalox radiant heaters on a 230 v line. Unequal spacing of the heaters and the use of a power

Tractor gas tank follows hood into horizontal section of infrared dryer

blower concentrate the heat in the areas through which the heaviest sections of metal pass.

Traveling through the 8 ft oven at a speed of 25 fpm the parts are dried during their 20 second exposure.

Variable heat control permits the passage of the gas tanks, with soldered joints, through the oven without softening the solder.

Paper Tension Control Cuts Calender Break Losses

FEWER calender "snap-offs," consequently less loss of time and product, have been among the benefits derived from the installation of a General Electric paper tensiometer on a paper machine. The P. H. Glatfelter specialty papers mill at Spring Grove, Pa. has the tensiometer mounted between the calender stacks, to control the tension at this vital point.

Operation of the instrument is based on a small 4 in. roller, riding on top of, and pressing slightly into, the moving sheet of paper. Variations in the sheet tension move the roller,

OUTDOOR INDUSTRIAL LIGHTING

MODERN OUTDOOR LIGHTING has made this plant storage area as accessible at night as during daytime operations. G-E Type 101-S luminaires with 500 watt multiple incandescent lamps are mounted two per pole at heights of 25 feet, spaced 80 feet apart, providing good outdoor illumination.

Double your plant area's usefulness by providing G-E outdoor lighting

Long ago good management tripled productive capability by providing proper *indoor* lighting—making possible extra work shifts when needed.

Now you can have 'round-the-clock "daytime" whenever you need it *outside* your plant as well as inside, with G-E outdoor lighting.

At relatively small cost, you can actually double the usefulness of your plant area facilities by doubling the time in which men can work there.

For example, in the above photograph, the outdoor area is used for storage of rough castings. When additional work shifts were added, it became necessary to light this storage area so that needed parts might be readily located—regardless of the time of day. (Many plants still on one-shift operation avoid interrupting production by doing all their heavy materials handling at night.)

Moreover, good outdoor lighting will provide protection against pilfering, sabotage and costly accidents.

In these and many other ways, your investment in adequate G-E outdoor lighting will pay for itself over and over again. Write for the complete story in GEA-3640, "Outdoor Lighting for Industrial Plants." Address *General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

451-168

MAINTENANCE & OPERATION

and its attached linkage changes the air gap of a magnetic structure inside the tensiometer. An electrical signal, proportional to the paper's

Tensiometer installed between carrier rolls in paper mill calender section detects sheet tension changes instantly

tension, is emitted, and is transmitted to the power unit. A resultant speed change in the calender stacks corrects the tension.

Coupled with an electronic amplidyne sectional drive, this tensiometer, employing only one small roll against the sheet, holds sheet tension constant regardless of freeness, consistency, moisture content or stack loading changes.

Sealing Concrete Floors Reduces Dust

Contributed by William Mallwitz Griggs, Cooper and Co.

IN OUR food processing plant, we were continually confronted with the problem of excessive dust. Much of this dust came from our concrete floors, subjected to movement of floor traffic, especially in the traffic lanes used by heavy steel-wheeled trucks. No matter how diligently the brooms were applied, the pores of the concrete floors retained dust and dirt. This dust rapidly moved from the floor and settled on our stocks and fixtures, making frequent dusting a necessary evil.

To retain the wearing qualities of the concrete, reduce its dusting and facilitate cleaning of the floors, the use of a Multi-Clean sealer and preserver was initiated. The sealer minimizes the tendency of the concrete to dust, and prevents chipping of the floor. The surface becomes impervious to moisture, grease and chemicals. The compound seals off the concrete pores, thus removing the dust retaining pockets.

Now, the floors are mopped once or twice a week, and polished once monthly. The floor finish retains a lustre and hard surface. Practice has dictated a renewal coat of compound normally once a year. The preserver can be applied as a patch without showing overlap and therefore is ideal for surfacing a heavily-traveled aisle one side at a time, without disrupting traffic. Our dust problem has been effectively minimized and the floors are more durable and attractive.

Anti-Smudge Triangles

Contributed by Sidney V. Worth

PUTTING "hob-nails" on drafting triangles solves the irksome problem of smudging ink lines and eliminates the smearing of dirt when moving the triangle across a drawing.

The lifts can be made of powdered or fine-filed plastic. Dissolved in acetone, the powder forms a paste which is easily spotted on the triangle. The evaporation of the acetone leaves the nob adhering to the

Triangle size determines lift locations

triangle. Height of the lift can be increased by adding additional layers of the paste.

Triangle size determines the number of nobs (the bigger the triangle, the more nobs used) and a height of 1/64 to 1/32 in. is recommended. Placing the lifts on the triangle in lines parallel to the sides reduces the number of potential smudge points on the triangle.

Stack Your Trucks— Wheels and All

IN THEIR Philadelphia warehouse, Sears Roebuck and Co. make full use of the space above the first layer of storage, even in the storing of mixed goods.

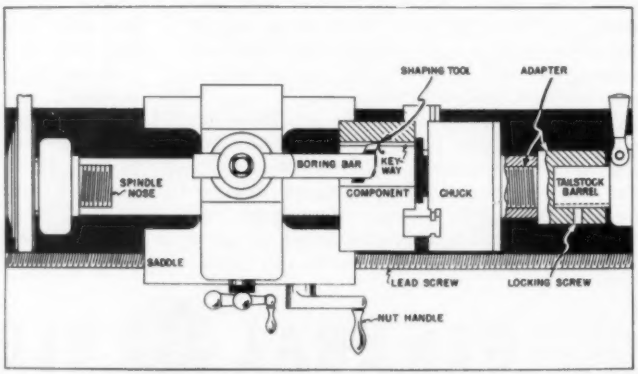
Power Feed Adapted for Cutting Keyways on a Lathe

Contributed by F. E. Riley

WITHOUT REMOVING the workpiece from the lathe chuck, a shaft sleeve can be turned, bored, and internally keyed. The keyway cutting however, can be a tedious process. Since application of the power drive to the lead screw would also turn the spindle, the longitudinal feeding must be done by hand. While hand operation is economical for small keyways, it becomes more impractical as the key size increases.

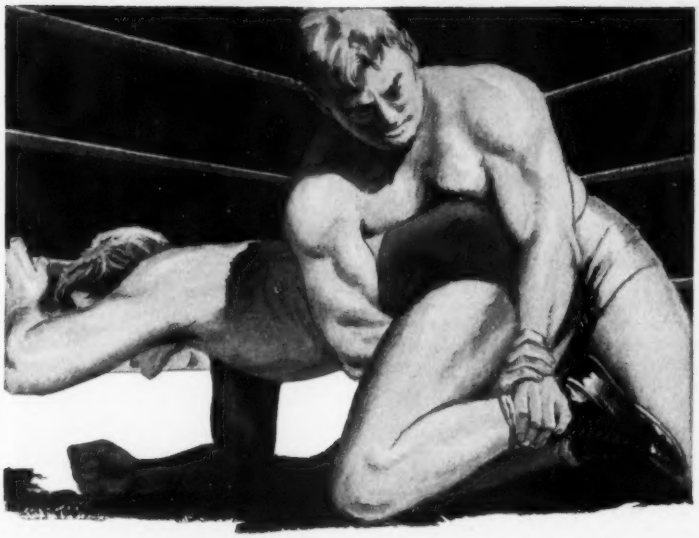
The use of a simple adapter on the lathe tailstock provides a means of utilizing the lathe drive to operate the longitudinal feed mechanism. The adapter can be made from round stock. One end is turned and threaded to duplicate the lathe spindle nose threads. The other end is bored to a push-fit over the tailstock barrel, and is drilled and tapped to receive a set screw.

The design permits the removal of the chuck, with the work still secured, from the spindle to the adapter-fitted tailstock. With the adapter locked in place, the chuck is screwed on the threads. The work is thus held stationary, and power can be applied to the lead screw to feed the boring bar and tool.

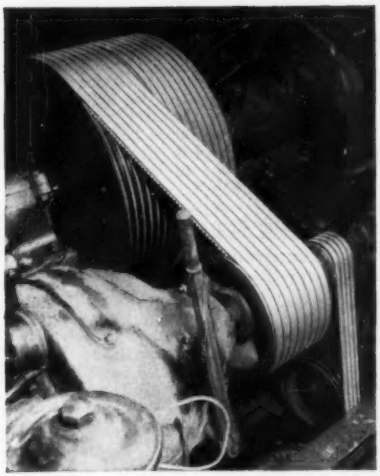


Plan view of lathe bed shows position of adapter screwed on tailstock barrel

Dayton Cog-Belts* *bend* better...*are* better!

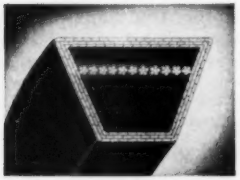


Dayton raw-edge Cog-Belts are the *only* V-Belts scientifically designed to bend as easily as your finger. The cogs "close up"—take up the compression as the belt goes around the pulley. Result: Less strain . . . cooler running . . . smaller pulleys . . . 40% more horsepower . . . much longer belt life.



See HOW MUCH better Cog Belts are!

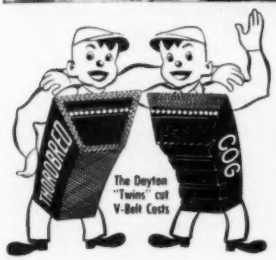
This V-Belt drive transmits the power from two diesel engines to a dredge pump, which delivers 100 cubic yards of sand and gravel per hour. The former drive used 16 ordinary V-Belts which were capable of handling 140 constant horsepower. But the dredging company wanted to step this up to 188 horsepower, to meet new production requirements. Trouble was, the increased load meant adding more belts—*and there was no room for pulleys with more grooves!* The Dayton Distributor simply put Cog-Belts on the drive. Now the same number of belts carry the increased load—and the dredge's space problem is solved. Whether *your* drive problem is *space, cost,* or *longer life,* it will pay you to look into the advantages of the Dayton Cog-Belt.



FOR REGULAR DRIVES . . . THE DAYTON THOROBRED V-BELT IS TOPS!

The Dayton Thorobred V-Belt is the V-Belt for standard drives. Its patented, three-prime-section design, containing high-tenacity rayon cords, and its durable double wrap, result in exceptionally long life. The Dayton Thorobred V-Belt has set completely new standards for long life and trouble-free service at minimum cost!

*T.M.



See "Belting" in the yellow pages of your local telephone directory for the Dayton V-Belt Distributor. Let him solve your drive problems!

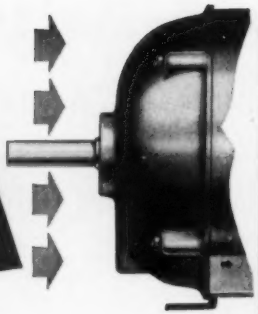
Dayton Rubber

Since 1905

World's Largest Manufacturer of V-Belts

DAYTON RUBBER COMPANY • DAYTON 1, OHIO

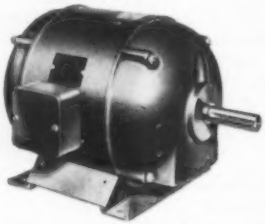
HERE'S *Full-Height* MOTOR PROTECTION



Shrouded End-Heads give R&M Motors a Head Start on Lower Maintenance

OPENINGS ARE SCREENED

Openings are screened in standard All-Weather Motors to exclude rodents attracted by warmth, and prevent the entry of air-borne debris which might obstruct air passages. R & M high-velocity end-to-end "Clean-Sweep" ventilation has no converging currents to deposit clogging dirt.



Types include drip-proof, splash-proof, explosion-proof, totally enclosed fan-cooled, and vertical motors with drip-proof or splash-proof housings. Sizes range from 1 to 7½ h.p. for single-phase and d.c.; from 1 to 50 h.p. for poly-phase. Drip-proof motor shown.

The extra protection of R & M end-heads is a "*plus*" all users appreciate, for—like R & M Weatherizing—it guards internal motor parts from harm and serious damage. You can see for yourself how this full-height enclosure sheds falling liquids and objects—why open-type motors, *even outdoors*, require no other cover.

"ALL-WEATHER" MEANS "USE ANYWHERE"

This *special kind* of standard motor is the finest we've ever built—the finest you've ever used. It's ideal for any environment . . . where it's dry, dusty, humid, damp; in mild acid or alkaline fumes. And R & M Quality in bearings, windings, insulation—in *every* construction detail—is carefully preserved for longer life by exclusive design or shielding.

PROTECTED INSIDE AND OUT

Nowhere else can you get the performance protection of R & M All-Weather Motors. FIRST, shrouded end-heads. SECOND, rotor and shaft are rust-inhibited. THIRD, stator and shell have a baked-on coating of moisture-resisting "Robbinite." FOURTH, cast-iron end-heads and terminal box receive anti-corrosion treatments. FIFTH, terminal box is gasketed. SIXTH, lead-ins are sealed. SEVENTH, end-head openings are screened. EIGHTH, repellent grease keeps moisture away from the extra-wide, sealed ball bearings.

AN EASY WAY TO CUT MAINTENANCE

Don't be satisfied with *less* than R & M All-Weather excellence. These cool-running, long-lasting motors sell at the *standard motor* price. And when you buy new powered equipment, specify "Robbins & Myers." Write for the All-Weather Story, Bulletin P-400-E.

R&M means Reliable Motors

ROBBINS & MYERS • INC.

SPRINGFIELD 99, OHIO • BRANTFORD, ONTARIO

MOTORS • HOISTS • CRANES • FANS • MOYNO PUMPS

A unique application of material handling and storage was evolved around the use of special 4-wheel warehouse trucks, made by Equipment Manufacturing Co. The individual trucks can be moved around

Photo: Automatic Transportation Co.

Operator places truck load of appliances on top of stack. Corner legs support entire weight of the trucks and loads

the warehouse floor on wheels, to fill delivery orders. These loaded trucks are assembled according to destination of the order. By virtue of the "nesting leg" feature of the trucks, they can be lifted and stacked by electric lift trucks. Use of these pallet-hand trucks permits stacking of loose goods, since the legs are the load bearing members of the stack.

Babbitt Bearing Repair Hints

Contributed by Herbert Bouton

MAINTENANCE and repair experience in a woodworking shop has convinced the writer that bearings are of prime importance in any machine maintenance program.

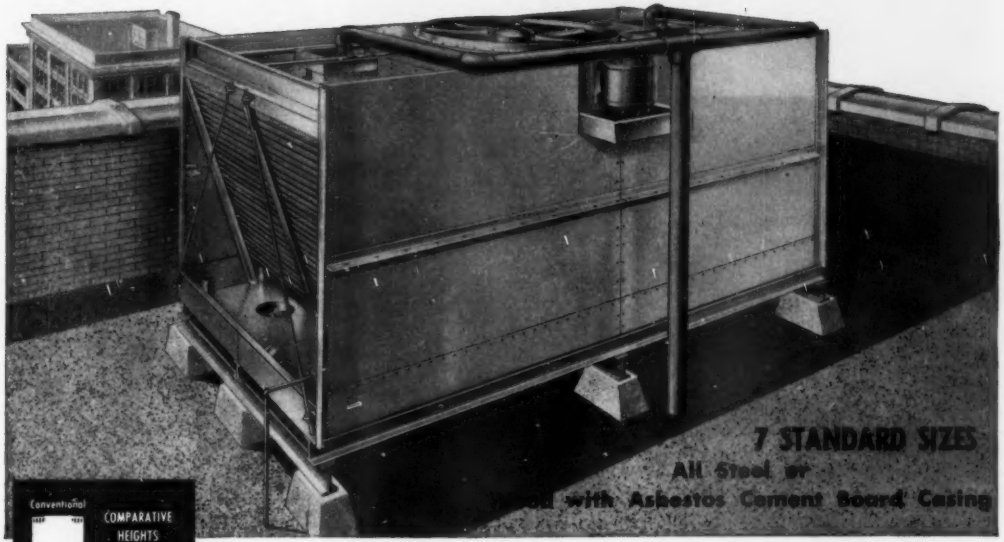
Modern high-speed machines are usually fitted with ball or roller bearings, with maintenance necessarily limited to proper installation and lubrication.

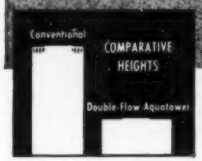
There are, however, older machines still in operation that were constructed with babbitted main shaft bearings. Repairs to a vibrating main bearing on one of these older machines require considerably more labor than the simple replacement of a ball bearing on a shaft. Inspection of the journal must be rigid, preferably in lathe centers for indication, and any wear in the shaft must be overcome by reducing the size of the shaft or building the shaft to its original diameter.

Whatever the process of preparing

NEW DOUBLE-FLOW AQUATOWER

Marley Introduces Lowest Silhouette, Lowest Pumping Head Cooling Towers For Intermediate Capacities





New Simplicity • New Accessibility • New Efficiency

By combining the outstanding features of the large patented Double-Flow and the smaller Aquatower (both accepted leaders in their fields), Marley has produced the cooling tower that will set the standard in another size range . . . THE DOUBLE-FLOW AQUATOWER. Architects, engineers and contractors will be equally enthusiastic about this tower because it is highly efficient, lowest in height and harmonious with building design, and remarkably easy to erect.

The Double-Flow design means low tower height and low pumping head; efficient air utilization—one fan drawing air from two completely open sides—with consequent minimum fan horsepower requirement. Open distribution, "at-a-glance" inspection are features, as are minimum load concentration and economical grillage and support.

From the Aquatower comes simplicity . . . of construction, of piping, of operation. The nailless Redwood filling that is very easily installed or removed is another adaptation. All basin fixtures are readily at hand. Double-Flow Aquatower mechanical equipment is all designed, manufactured and guaranteed by Marley specifically for cooling tower usage . . . and it is all completely accessible.

You'll want complete details of this tower that will fit many installations in many industries, typical of which are those requiring 50 tons or more of refrigeration. Fill out the coupon below and you will receive it immediately.

Producers of
DOUBLE-FLOW TOWERS
AQUATOWERS
VAIRFLO TOWERS
CONVENTIONAL TOWERS
DRICOOLERS
NATURAL DRAFT TOWERS
SPRAY NOZZLES

MARLEY

The Marley Company, Inc.
222 West Gregory, Kansas City 5, Mo.

Send me your 8-page brochure on the new Marley DOUBLE-FLOW AQUATOWER.

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Firm_____

Address_____

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product
NEW!
Lock 'em—and Leave 'em
● If you have a problem lifting, moving or containing bundles of bars, rods, or pipes—forget it. Get some of the new AMERICAN Bundling Chains with automatic locks. They're easy to hook up, and once you lock them, they stay locked. Yet you can unlock them with a flip of the fork. Satisfied users tell us they have made possible real savings in handling costs.
Write today for information on Bundle Locks or the 1001 other items in the complete AMERICAN Chain line.
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the journal, pouring the babbitt bearing must be done with extreme care and with consideration of the size and operating speed of the shaft involved. A large, slow speed shaft can be poured with the shaft as the pouring mandrel, inasmuch as the size of the shaft offsets the warping tendencies of the hot babbitt.

With a high speed, small diameter shaft, more care must be exercised in the pour. A pouring mandrel should be made, preferably of pipe (to decrease the heat absorption) a few thousandths oversize to provide a final fit of one and one half thousandths clearance per inch of shaft diameter.

Close attention to detail in the pouring of bearings, as described, should enhance the chances of obtaining a good bearing with each pour. In the event of a hot bearing, however, the following method of removing high spots is suggested: let the bearing heat, but provide sufficient lubrication to protect the bearing and the journal from permanent damage; then allow the bearing to cool to room temperature, preferably overnight. A new start with the bearing cool will often prove successful.

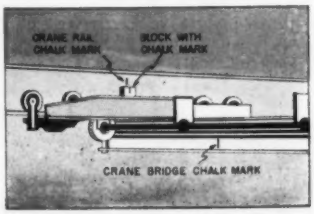
This reaction can be explained by considering the expansion of the two metals involved. The steel expands more than the babbitt, and when the metals cool, the babbitt, being less elastic than the steel, does not resume its original proportions. This contraction, plus the pressure of the steel as it expands, results in a small clearance being formed at the high spot, exactly where it is desired.

The maintenance of babbitted bearings, therefore, can be considered fundamentally a case of the mechanic's familiarity with proper lubrication, and his knowledge of what to do and expect when pouring new bearings.

Crane Positioner

Contributed by John Kropets, Allis-Chalmers Manufacturing Co.

A SIMPLE crane positioning aid speeds up operations in the plant test stand areas. With an indicating block mounted on the crane bridge and one mounted on the crane trolley, marks on the respective supporting beams indicate the center location of an often used crane drop.



Indicators speed crane drop locating

Drums on Pallets Handle Easier

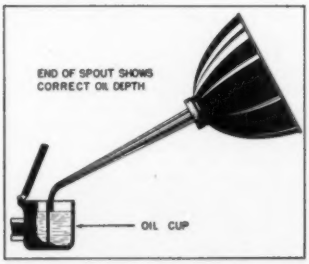
HANDLING OF drums has been simplified considerably at the Westinghouse East Pittsburgh Works, by the use of special pallets. Designed to

Four-drum pallets eliminate need for an overhead crane in this storage area

accommodate four drums, laid horizontally, the wooden pallets permit multiple handling on fork trucks, of the drums that were previously handled singly by overhead hoists.

Removal of the hand labor formerly necessary has made this drum handling operation faster and safer. Suitable pallets can be quickly constructed of rough lumber, to fit any size drums.

Oil Depth Gauge



Oil can spout end becomes depth gauge for quick filling of identical motor bearings when a wire rod, soldered on the spout, is cut to indicate correct depth

Protective Jacket For Insulation

ALONG WITH the obvious safety hazard involved in the presence of a pipe run at floor level, insulation on such a pipe is extremely vulnerable to mechanical abuse and destruction.

Protection from this abuse is af-

an ACCO product

Set Endurance Records

● Alloy steel gears, self-lubricating ball and roller bearings, preformed improved plow steel cable, grooved drum, rigid metal weatherproof wire conduits, silver contact controls . . . these are but a few of the features that mean long life and low maintenance of the finely balanced WRIGHT *Speedway* Frame "B" Hoists.

Call your distributor today for full information on the WRIGHT ***Speedway*** FRAME "B"... or write to us direct.

ACCO

WRIGHT HOIST DIVISION
AMERICAN CHAIN & CABLE

TRADE MARK

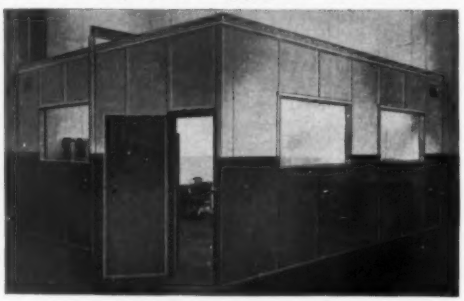
York, Pa., Chicago, Denver, Detroit, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

WRIGHT
Hoists
Trolleys
Cranes

CAN BE EXPENSIVE!

● It's easy for shop personnel, working in the bedlam of the ordinary shop office, to make mistakes. Phone messages are difficult to hear, and ordinary conversation is often next to impossible. When communications break down, misunderstandings and mistakes begin—*and one mistake can be costly!*

It's easy to overcome this difficulty by erecting plant offices constructed of noise-deadening ISC "Soundmetal" panels. They're easy to erect, easy to move to another location, and flexible to fit available space. And they prevent jangled nerves, and needless and costly mistakes, by shutting out plant noise.



Machinery noise above certain levels can bring serious results—reduced worker efficiency—and output—permanently impaired hearing. The potential cost of claims for deafness caused by working conditions is a matter of grave concern to industry.

When profit depends on employee output, it's foolish to take chances with employee morale—and risk damage suits as well.

Write today for full information.

Midwestern distributor: **Midwest Industrial Sound Control, Inc.**
1455 North Pennsylvania Street, Indianapolis, Indiana

Industrial Sound Control, Inc.

45 GRANBY STREET, HARTFORD, CONN.
2119 SO. SEPULVEDA BLVD., LOS ANGELES, CALIF.

forded by a sheet metal jacket wrapped around the insulation, to cover the area most likely to be damaged. The joint in the jacket may be tack-welded, or flanged and bolted. Should large sizes or extreme temperature changes require it, the jacket can be given an expansion joint by using spring-loaded

Photo: Magnesia Insulation Mfg. Assoc.
Sheet metal jacket becomes "bumper" for insulation on in-the-way pipe runs

bolts to allow circumferential expansion.

Overhead lines can be similarly protected from damage incurred when ladders are placed against the pipe, or when chain hoists are used adjacent to the pipe, and the operating chain rides across the insulation.

Internal Honing With a Wire Brush

BY INSTALLING a wire brush in the chuck of a drill press, and providing a pneumatic ram to operate the vertical feed rack, the Curtiss-Wright Corp. saved the cost of new internal honing equipment.

To clean the threads and polish an internal bearing area in their propeller hubs, a jig was designed

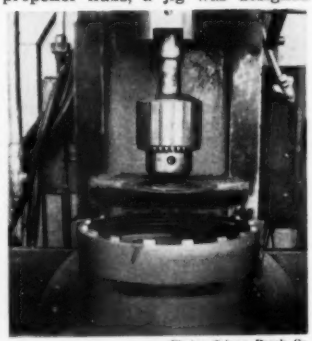
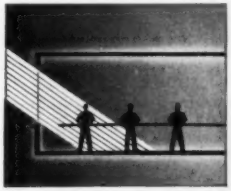


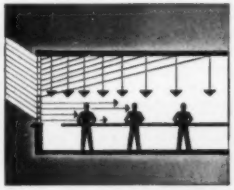
Photo: Osborn Brush Co.
Brush is fed into a hub on drill press

Window maintenance problems are virtually ended once Insulux is in—no painting, no rust or rot, no shades, no harmful glare—just plenty of free, natural, comfortable daylight.

Daylight is free . . . use more of it through Daylight Engineering

The problem of daylighting industrial areas can be solved by the selection of the proper Insulux Fenestration System. No longer is it necessary to paint out or shade glass areas in your plant to control glare. Light control through Daylight Engineering with Insulux light-directing glass block makes it possible to use the *entire* glass area for the transmission of light.





Direct sun causes uncomfortable brightness near windows, extreme contrast in other parts of room. Insulux Fenestration directs and spreads part of the daylight to the ceiling—diffuses the balance, keeps brightness at comfortable levels.

New Insulux Glass Blocks Numbers 363 and 365 reduce the necessity for careful orientation of glass areas because they control light so efficiently that they virtually "*turn your building with the sun.*"

Over and above daylight control other advantages in the use of Insulux Glass Block are:

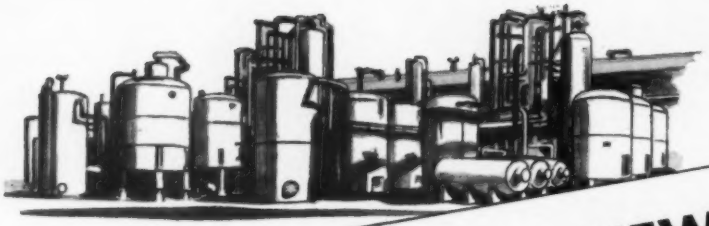
(1) They are permanent; they do not rust or rot.
(2) They have a high insulation value.
(3) They are immediately available.

Daylight is free—Don't abuse it—Use It. Ask for the services of a Daylight Engineer to help you solve your daylighting problems. Just call, or write: Daylight Engineering Laboratory, Department P.E. 2, Box 1035, Toledo 1, Ohio. *Insulux Division, American Structural Products Company, subsidiary of Owens-Illinois Glass Company.*

INSULUX GLASS BLOCK

INSULUX FENESTRATION SYSTEMS

—by the pioneers of Daylight Engineering



Artist's sketch showing part of C. and C. C. C. Texas City plant.

EXTRA **Pitt Chem NEWS** EXTRA

VINYL COATINGS CUT MAINTENANCE COSTS 49%

HERE's actual case-history proof of the way vinyl coatings can cut surface maintenance costs in your plant. From 1946 to 1951, the Carbide and Carbon Chemicals Corporation protected their Texas City plant and equipment with tough, long-lasting vinyls instead of ordinary maintenance coatings. The result? Better, longer-lasting surface protection at little more than half the total cost!

Why not let us show you how Pitt Chem Vinyl Coatings can save you money and do a *better* job of protecting your plant and equipment against corrosion? These durable coatings provide excellent protection against a wide variety of corrosive liquids and fumes, including acids, salts, alkalis, petroleum products and alcohols. Just drop us a line outlining your problem and we'll provide you with the specific information or technical assistance you need.

PITT CHEM is Industry's Most Comprehensive Family of Protective Coatings

- ★ COAL TAR
- ★ ALKYD
- ★ CHLORINATED RUBBER
- ★ VINYL
- ★ PHENOLIC
- ★ EPOXY
- ★ OTHER SPECIALTY COATINGS

W&D 4023

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to hold the hubs on the drill press table. The wire brush is fed into the hub on an electrically timed cycle. The ram operates the rack, forcing the brush into the hub; holds it in position for a predetermined time, to clean the inner bearing surface; then withdraws the brush, ready for the next hub cleaning cycle.

Cart Eases Battery Handling

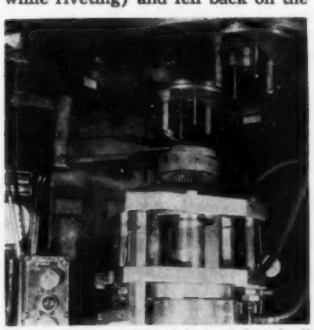
Photo: Gould-National Batteries, Inc.

Casters and an angle iron framework added to a roller conveyor section make up a battery cart, designed to speed truck handling at the charging station

Automatic "Catcher" For Hydraulic Press

ATTACHMENT of a tray-type automatic catcher to a hydraulic press used by Westinghouse Lima Works for riveting stator-core laminations has eliminated a slow, dangerous operation.

Before, as the press retracted, the core was stripped from the sizing plug (used to maintain bore size while riveting) and fell back on the

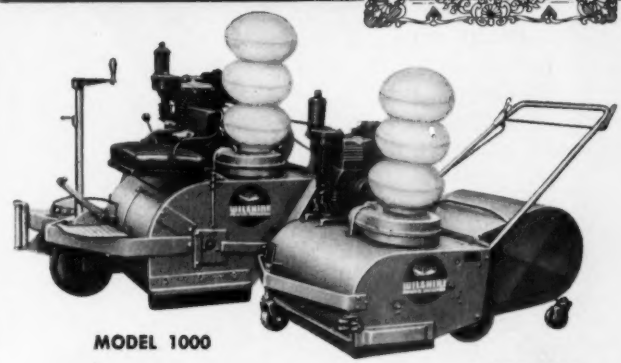


Tray catches stator as it is stripped off the hydraulic press plug after riveting

positioning fingers. The operator had to remove the core by hand from the fixture fingers.

Now, the core falls on an automatic catcher and is swung from under the press head to an adjacent conveyor.

Do you realize how much it costs you to operate a broom?



MODEL 1000

MODEL 800

WILSHIRE POWER SWEEPER

CUTS *YOUR* SWEEPING COSTS 75%

(A Free Demonstration Proves It)

A SIZE FOR EVERY PURPOSE

Four Models for sweeping swaths of 27", 36" and 48". For all types of sweeping, from light to heavy duty, with and without dust control. For sweeping inside or outside areas. Easy to operate; easy to maintain. A survey of your needs enables us to recommend the Model and Size best suited to your requirements. Write for a Free Demonstration.

WILSHIRE SWEEPS *CLEANER — FASTER — SAFER*

WILSHIRE Power Sweepers do a better job than you can do with a broom . . . and do it faster. They sweep right up to the walls and posts . . . down narrow aisles. Clean floors are safer, too. Less wear and tear on tires on mobile equipment; lower fire hazards; less danger of accident due to workmen slipping or stumbling. WILSHIRE Power Sweepers give you all these advantages . . . and more . . . for less than you are now paying to operate a broom. Let us prove it to you. No obligation.

WILSHIRE POWER SWEEPER

526 West Chevy Chase Drive
Glendale 4, California

UNIBESTOS-TYPE

YOU PAY NOTHING EXTRA FOR Amocel

...THE MAINTENANCE-SAVING PIPE INSULATION

Amocel for commercial uses—like famous Unarco higher-temperature Unibestos—is made from strong, resillient Amosite, the amazing African asbestos. Designed for temperatures up to 600° F., it's a premium product in every way—clean appearance, long life, high efficiency—and it's easy to fit so you save from the first with this better insulation. Made in standard, 1½", and 2" thicknesses for pipe sizes from ½" to 12" in half-rounds with jacket and metal bands. Your Unarco Distributor has Amocel. Call him or write for literature.

- UNHARMED BY MOISTURE, STEAM, OR FUMES
- LIGHT, STRONG—WITHSTANDS IMPACT AND VIBRATION
- MAY BE REMOVED AND REUSED REPEATEDLY WITHOUT DAMAGE OR LOSS OF EFFICIENCY

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UNION ASBESTOS & RUBBER COMPANY

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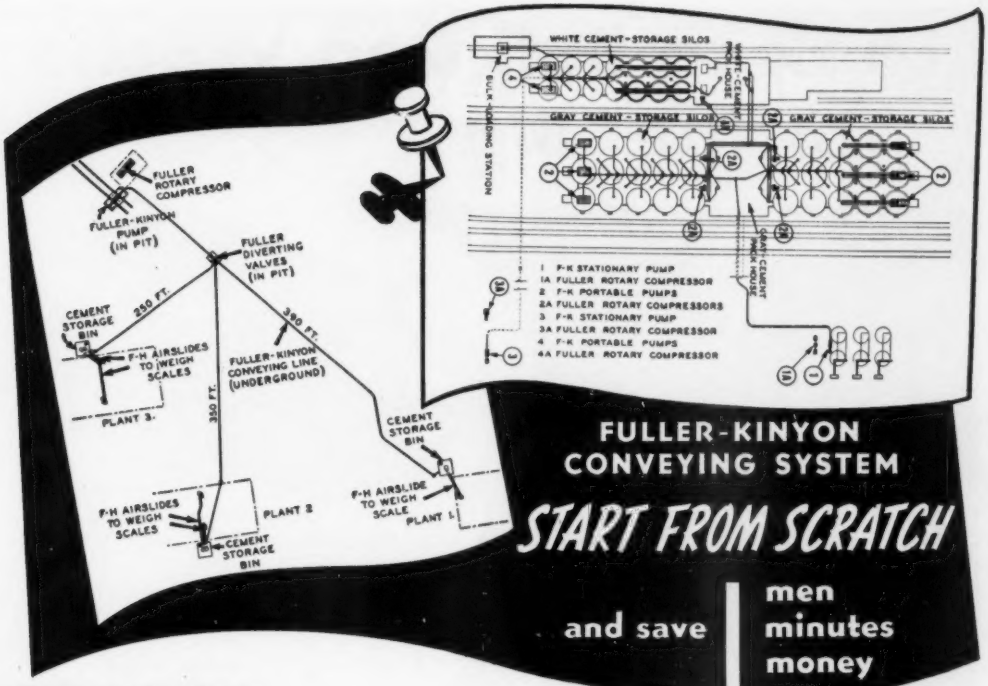
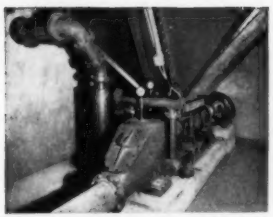


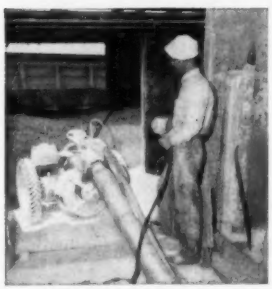
FULLER-KINYON CONVEYING SYSTEM

START FROM SCRATCH

and save | men minutes money



Fuller-Kinyon Stationary Pump conveying from bin.



Fuller-Kinyon Unloader unloading from box car.

The best way to solve any problems of conveying dry pulverized and granular materials is to "Start From Scratch". By that we mean, get all the facts on pneumatic conveying systems while you are still in the planning stage . . . either when building a new plant or modernizing an old one. Pneumatic conveyors permit economy and convenience in location of buildings and production equipment without the restrictions or straight-line limitations of mechanical conveyors. The layout of the conveying system can be designed to meet the specific requirements of the job, to conform exactly to local conditions, to insure minimum cost for erection, maintenance, and supervision.

Right there is where Fuller comes into the picture. As engineers and builders of four basic types of pneumatic conveying systems, Fuller is able to provide the exact system best suited to individual requirements.

Shown here is the Fuller-Kinyon System for conveying dry pulverized materials. It has many advantages: conveying pipe lines can be located anywhere—underground, suspended on simple hangers overhead, vertically, around corners, over long distances, and to practically any number of delivery points. There are no mechanical or explosion hazards. Conveying is clean, fast, and at minimum cost per ton of material handled.

We invite you to have Fuller Engineers make a complete survey and study of your plant plans—investigate local conditions and the material to be handled. Then they will make recommendations as to the system best adapted to your needs—enable you to save time, money, and material by having both plant and system built at the same time. To consult them places you under no obligation.

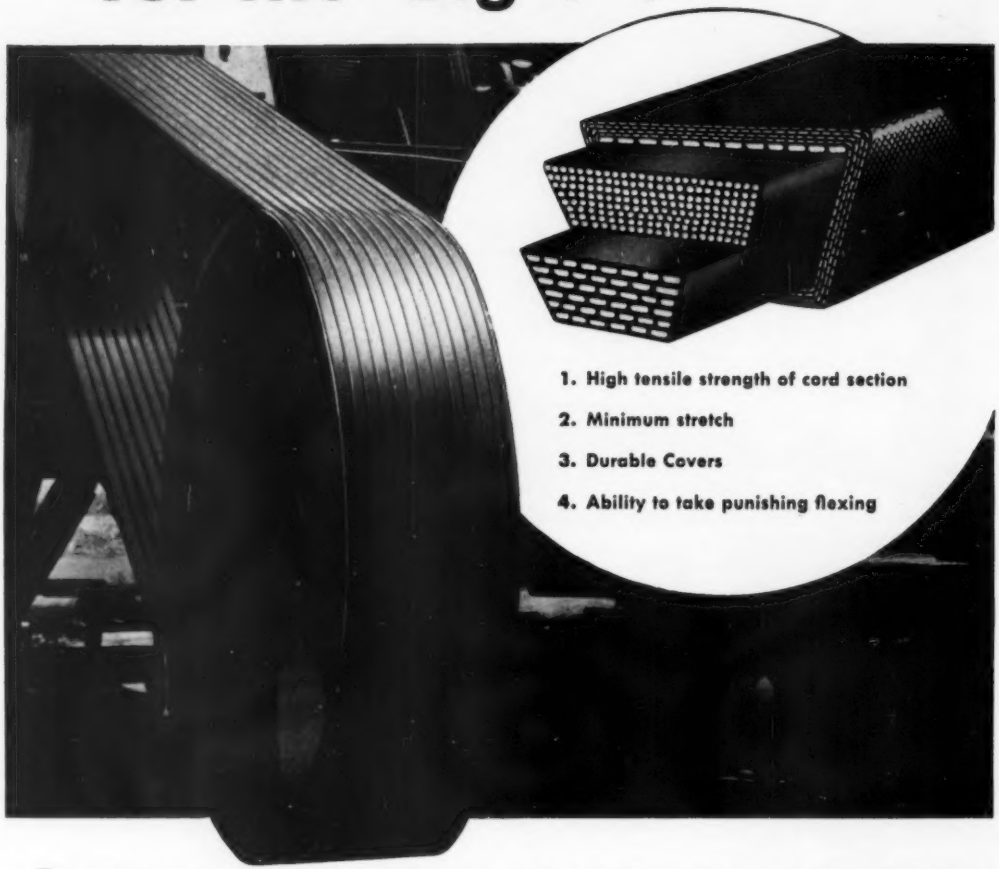
FULLER COMPANY, Catasauqua, Pa.
120 So. LaSalle St., Chicago 3 420 Chancery Bldg., San Francisco 4

P-130

Fuller

DRY MATERIAL CONVEYING SYSTEMS AND COOLERS — COMPRESSORS AND VACUUM PUMPS — FEEDERS, AND ASSOCIATED EQUIPMENT

Look to Bull Dog V-Belts for the "Big 4"!



For peak performance and longer belt life, you need *all four* — and *you get all four* with Bull Dog V-Belts.

First, let's look at the BWH Cord Section. It's specially engineered for high tensile strength. That's the only safe way a belt builder can provide and you can obtain the superior load carrying capacity you want. (Also the stamina to absorb shock loads.)

Secondly, Minimum Stretch. Stretch may be desirable in a girdle but not in a V-Belt — if you want less slippage, fewer adjustments, extra belt life!

Durable Covers — you can *see* how Bull Dog covers stand up! Closely woven, heavy, bias-cut fabric is used to take the severe wearing action where belt and sheave meet. Result: longer wear and sealing against penetration of dirt, grease, moisture.

Last, ability to take heavy flexing is no problem with Bull Dog V-Belts. Compounds are *quality-controlled* for cooler running. They *won't* break down or deteriorate.

TOUGH PROBLEMS INVITED — Ask your nearest BWH distributor about your V-Belt, transmission belting, conveyor belting and hose problems. He's a *specialist!* Or write us direct about how to make rubber products work *better, longer.*

Another Quality Product of

BWH — DEPENDABLE RUBBERWARE

BOSTON WOVEN HOSE & RUBBER COMPANY

Warehouse Stock: 111 N. Canal St., Chicago, Illinois **Distributors in all Principal Cities**

PLANT: CAMBRIDGE, MASS. • P. O. BOX 1071, BOSTON 3, MASS., U. S. A.

A NEW Steelcote PRODUCT

STAINLESS STEEL COATING For All Metal Surfaces

Now Stainless Steel Protection for About 4¢ Per Square Foot

This new development in surface coatings is the long sought answer to rust, corrosion and other types of deterioration caused by salt air, industrial atmospheres, alkalis, oils, greases, most strong acids, heat, cold and sunlight. Steelcote Stainless Steel Coating is non-inflammable, odorless, tasteless when dry. Economical because it continues to protect long after other coatings and enamels fail. Reduce your depreciation and upkeep costs now. Give us the facts about your difficult surface maintenance problems. We'll be glad to explain how Steelcote Stainless Steel Coating can whip them.

Write us on your letterhead for complete data on Steelcote Stainless Steel Coating.

Solves difficult surface maintenance problems in plants of all types.

Protects metal surfaces against effects of salt water and salt air.

Resists the action of sunlight, moisture and temperature changes.

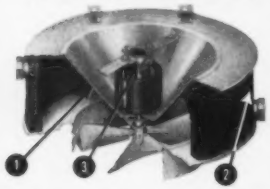
Steelcote Firsts: Lay-Tite Rubber Base Floor Coating • The First Enamel Containing Rubber • Steelcote Rubber Enamel The First Wet Wall Enamel • DAMP-TEX used in over 8,000 Plants.

STEELCOTE MANUFACTURING CO. *Established 1915* **Gratiot at Theresa, ST. LOUIS 3, MO.**

STEELCOTE LICENSED MANUFACTURERS

Standard Paint & Varnish Company, Ltd. Windsor, Canada • S. A. Establecimientos Sud Americanos Gratry Casilla de Correo 1169, Lima, Peru • Steelcote, Fabrica Argentina De Pinturas, S. A. Florida 336, Buenos Aires, Argentina

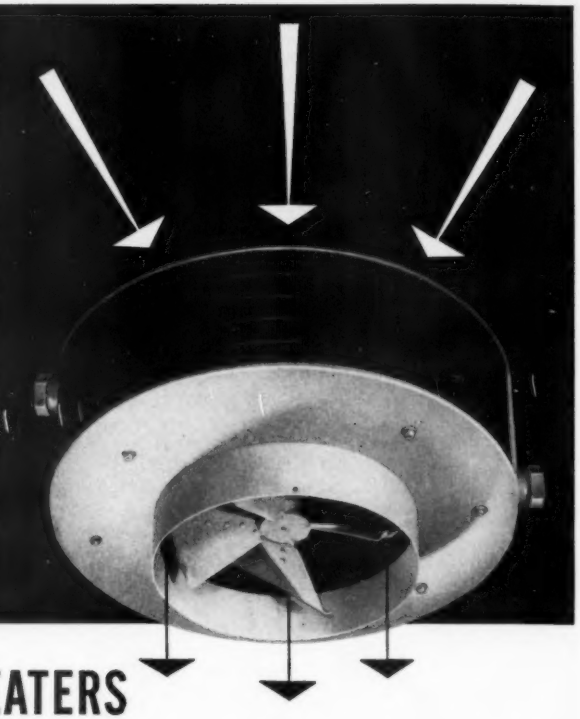
Outstanding Features of Dunham Heaters



1. Sturdy motor support cone effectively funnels air from heating element to fan; protects motor against heat and dust.

2. Improved header design requires fewer solder joints; assures uniform steam distribution; eliminates air pockets.

3. Resilient motor mounting absorbs motor vibrations, prevents transmission of noise through piping.



DUNHAM UNIT HEATERS

direct heat where you need it

quietly . . . economically . . .

Dunham Vertical Discharge Unit Heaters are designed to maintain perfect balance between air volume, velocity, and final air temperature. When you "buy Dunham," you get:

Heat Where You Need It—Choice of four different types of air diffusers assures proper directional control of heat throw; high volume of air funneled through fan promotes uniform heat distribution in a wide pattern.

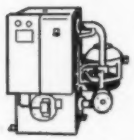
Quietly—Rubber-mounted motor minimizes vibration and noise; fans operate at slow speeds.

Economically—You cut installation costs. Location of supply and return tappings gives simplified piping hook-up with fewer fittings.

Another good point to remember: Dunham Unit Heaters are available in Horizontal Discharge, Blower Fan, as well as Vertical Discharge Types. Their quality performance is typical of *all* Dunham products. For example, Dunham Vacuum Pumps can pull *up to 26 inches* of vacuum year after year.

For further information on Dunham Unit Heaters, write for Bulletin 1301-20. Similar literature available on other products.

Horizontal Heater

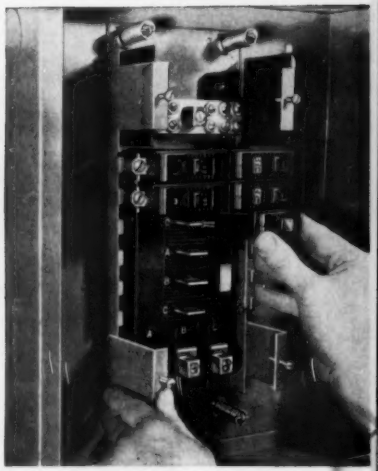


Vacuum Pump

C. A. DUNHAM COMPANY
400 West Madison Street, Chicago 6, Illinois
In Canada: C. A. Dunham Co. Ltd., Toronto
In England: C. A. Dunham Co. Ltd., London

DUNHAM heating systems and equipment

Vari-Vac Differential Heating • Baseboard Radiation • Fin-Vector Radiation • Convector Radiation
Condensation Pumps • Traps • Valves



QUICK-MAKE, QUICK-BREAK PLUG-IN BREAKER—Trumbull's new NLTQ Panelboard introduces the first *plug-in* circuit breaker with quick-make, quick-break operation. Other features: both *thermal* and *magnetic* protection . . . trip-free . . . pressure-type silver-plated copper plug-in contacts . . . all ratings physically interchangeable. Adjacent breakers are on alternate phases—assuring balanced loads and circuits.

New insulating material

KEEPS PANELBOARDS COOLER

The base of this panelboard interior is made of *Plastisol* . . . the first time this amazing plastic material has been used for this purpose.

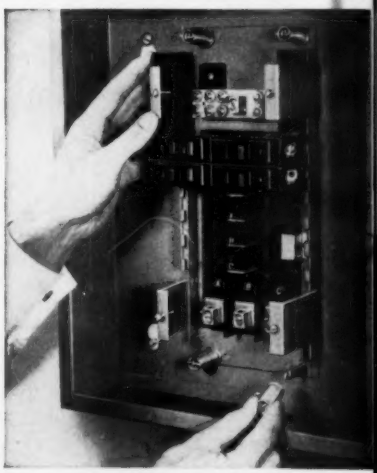
Here are some of the properties which make Trumbull's new NLTQ Panelboard a superior product which will give you excellent service.

Plastisol has very high thermal conductivity and is an excellent radiator of heat. Copper bus bars encased in Plastisol run 10% cooler than in open air!

SUPERIOR TO ALL OTHER TYPES OF INSULATION

Other Plastisol advantages making it superior to all other types of insulation for this purpose include its ability to resist acid and alkali, high temperatures (not harmed at 212 F), tracking and carbonizing. It will not shrink or become brittle, even at minus 30 F.

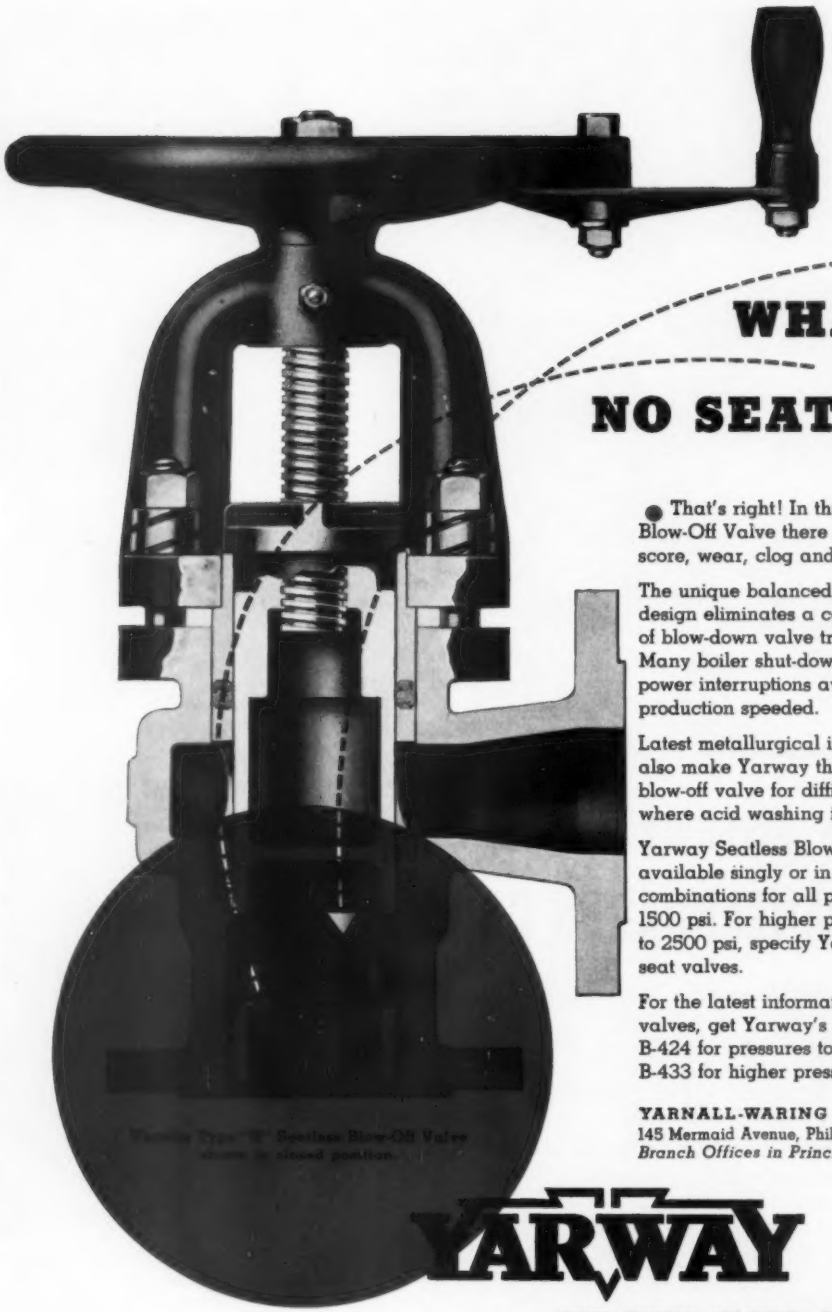
Trumbull's Plastisol base is Underwriters' Laboratories, Inc. approved and endorsed by the Electrical Council.



QUICK INSTALLATION—NO NUTS AND WASHERS—Interior is mounted in box by compression springs . . . which permit easy release for removal. Springs also permit lining up fronts regardless of uneven box installation. Trumbull NLTQ panelboards with lug or circuit breaker mains come in capacities up to 225 amperes in a range of 4 to 42 circuits. Write for Bulletin TEB-14.

TRUMBULL (T) ELECTRIC

DEPARTMENT OF GENERAL ELECTRIC COMPANY
PLAINVILLE, CONN.



WHAT?

NO SEAT?

● That's right! In this Yarway Blow-Off Valve there is no seat to score, wear, clog and leak.

The unique balanced sliding plunger design eliminates a common cause of blow-down valve trouble—the seat. Many boiler shut-downs are saved . . . power interruptions avoided . . . production speeded.

Latest metallurgical improvements also make Yarway the ideal blow-off valve for difficult service where acid washing is used.

Yarway Seatless Blow-Off Valves are available singly or in tandem combinations for all pressures up to 1500 psi. For higher pressures up to 2500 psi, specify Yarway Stellite-seat valves.

For the latest information on blow-off valves, get Yarway's newest catalog—B-424 for pressures to 400 psi, B-433 for higher pressures.

YARNALL-WARING COMPANY
145 Mermaid Avenue, Philadelphia 18, Pa.
Branch Offices in Principal Cities

YARWAY

BLOW-OFF VALVES

STOP BLOW-DOWN TROUBLES—KEEP BOILERS ON THE GO

Alcoa's Fence Painters Show How to POUR IT ON!

Estimate possible total savings for industry in the millions of dollars

A PAINT FOREMAN at Aluminum Company of America's New Kensington Works has hatched an idea worth millions of dollars to American industry.

The nub of paint foreman R. W. Spence's idea is to cover industry's millions of miles of wire fence by pouring aluminum paint, or any other kind, instead of spraying or brushing.

The new method of wire fence painting cuts maintenance costs in half.

Painters at the New Kensington Works were the first to use the method. Paint was poured from a two-gallon oil can with a flexible spout along the top portion of one section of the plant's wire fence. On both sides of the fence were suspended 5 ft. by 5 ft. panels which acted as a trough and coursed the paint over the intertwined wire.

The panels are kept as closely as possible in contact with the fence. Some bracing may be necessary on warped or damaged fence.

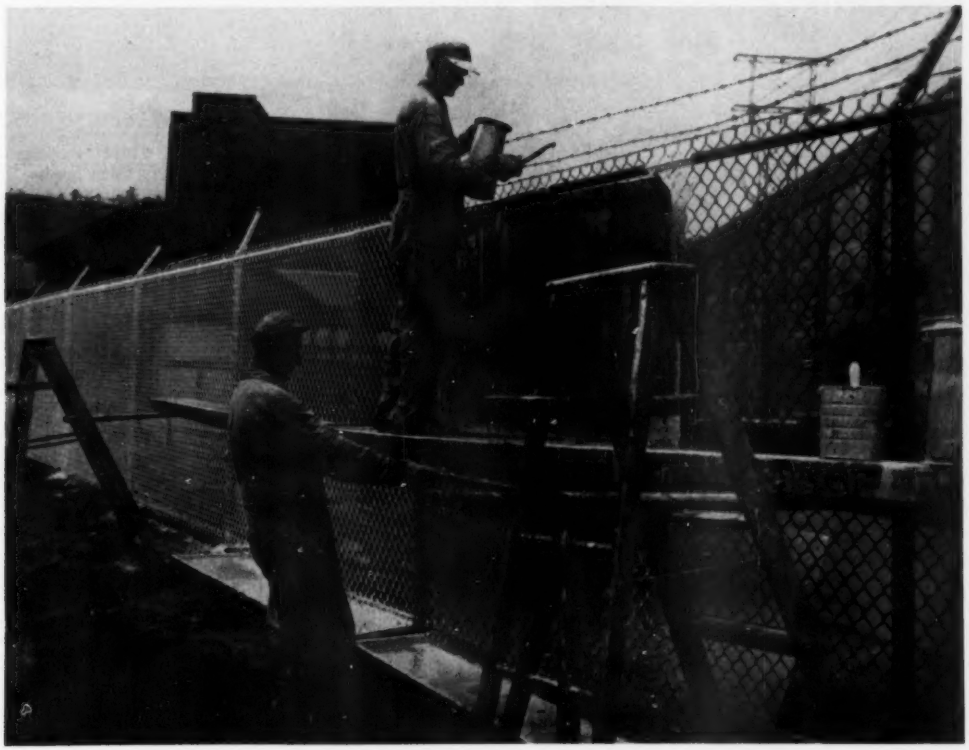
The paint flows over the fence and drains into a catch pan 2 ft. by 10 ft. by 2 in. for reuse. One catch pan remains under the section previously painted.

At the Alcoa plant, where no wire brushing was needed, one coat of red lead paint was poured and was followed by one coat of aluminum paint. The total cost including labor, burden and materials was 96 cents per foot of fence for the two-coat application.

Immediately after the pouring operation one painter went over the work to cover any skips and to paint portions of the posts not already covered. This is the only hand brushing required.

Using Mr. Spence's method of painting, the painters covered five-feet lengths of fence in four to five minutes.

A painter at New Kensington Works, Aluminum Company of America, pours, rather than brushes or sprays, paint on the company's wire fence. Panels shown in the photo, fitted closely on each side of the fence, guide the paint over the wire. As a result, coverage is better, faster and cheaper than by other methods used and maintenance costs are cut 50 per cent. Immediately after pouring the paint, one painter quickly brushes skips and portions of the posts not covered by pouring



POWER TOOLS —
The More Used, the Lower the Costs

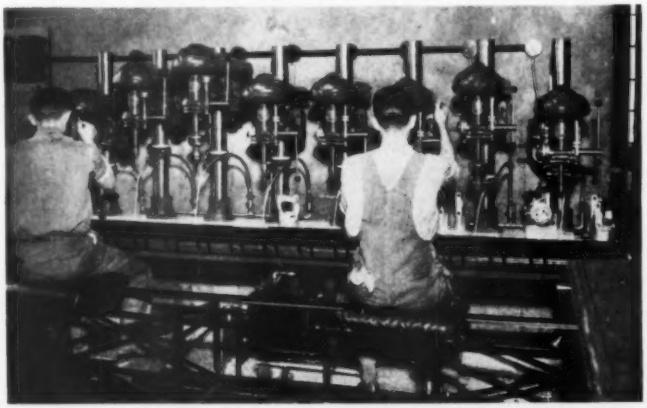
Lowered cost per unit of production is practically assured with the broad line of power tools now available for maintenance, construction or production work . . . Pictured here are a few usual and unusual applications of power tools, along with some cost studies made by various firms . . . Mounting of tools for greater utility, and seating arrangement for operators, are of help in increasing production too

THE EVER-CONTINUING demand for greater economy of operation but, at the same time, increased production, has many an engineer between "the devil and the deep blue sea." For innumerable operations in construction, maintenance and production, these demands are met admirably by the use of comparatively low-cost power tools. These smaller relatives of the huge machine tools that have made American production a thing to marvel at, also have their definite place in the industrial picture.

Batteries of tools, for example, strategically arranged and controlled are the heart of many light manufacturing and small sub-assembly operations. Surface grinders, drill presses, tilting arbor saws, belt sanders, small spot welders, abrasive wheel cut-off machines are but a few of the power tools that industry is employing to cut production costs.

For example, Gristede Brothers, Inc., New York City, recently built a warehouse with 350,000 sq ft of floor space; provision was made for a maintenance and carpentry shop for maintenance of the Company's 160 stores. Executives estimate that this shop turns out work which would cost them from $6,000 to $7,000 per month if the work were done outside.

Pictured here are a few outstanding examples of tool adaptation and tool cost studies. There are dozens of others similar to them insofar as ingenuity and imagination of the appliers are concerned. Great numbers of opportunities for like adaptations exist in practically every industrial plant in the country.



All Photos: Delta Power Tool Division

Sitting Pretty

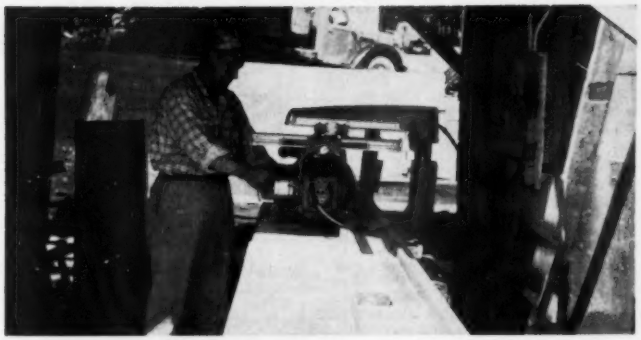
To make it easy for the operators of a long-table multiple-spindle drill press to move from one work station to another, Albertson and Company, Sioux City, Iowa, devised roller seats that travel on rails. When one man completes his series of operations he passes the work to the next man. Operators can travel the full length of the table with a minimum degree of fatigue

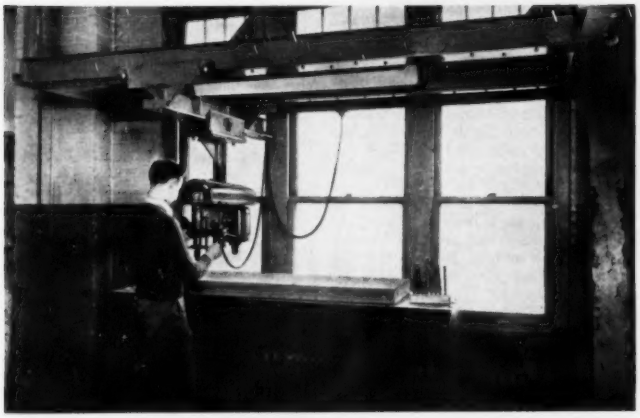
Handling Lessened

To speed up eleven operations on an aluminum grid casting (the eleven operations include drilling, reaming, counterboring and countersinking) Sangamo Electric Co., Springfield, Ill., uses a 15-ft sectional table and eleven 17-in. drill presses for the individual operations. The casting moves from one machine to the next and a great deal of costly trucking, handling is eliminated

Construction Jobs

"Over $1,300,000 worth of construction with a radial arm saw expenditure of less than $400." This is the statement made by Metcalf-Hamilton Construction Co., Kansas City, Mo. The saw shown in the photo was used to perform all the sawing required in the construction of three apartment buildings and many other smaller projects. The company states that the machine has run a minimum of 4,000 hr at an average cost of 10 cents per hour. Only maintenance cost was the price of a new switch



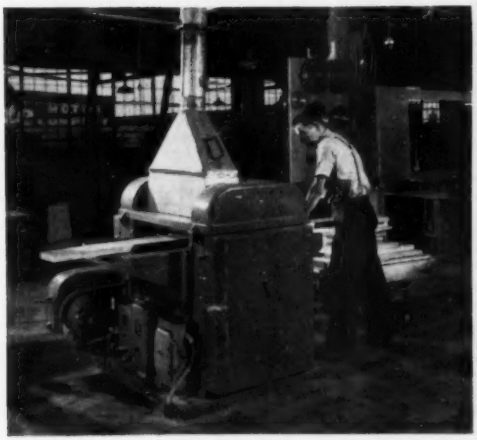


Work Suspended

With an overhead crane mounting that Kirkhof Electric Co., Grand Rapids, Mich., has developed, a 17-in. drill press will drill holes in any location on 36 in. by 96 in. switchboard panels without moving the panels. Both the drill head and bridge are suspended from ball bearings riding on flat, cold-rolled bars and the whole framework is supported from the building's steel structure for a clear field of operation. Panels are of ebony asbestos or steel

Cost of Displays

Gardner Display Company, Pittsburgh, manufacturers of exhibits, dioramas, demonstration pieces, uses a planer on an average of two hours per day. The planer is equipped with a sectional in-feed roll and a sectional chip breaker that makes it possible to feed two and sometimes more pieces of varying thickness through the planer at one time. The planer knives are ground by Gardner with a special knife-grinding attachment without removing the knives from the roller. It has a per hour cost, including depreciation, interest, maintenance, repair, power cost and labor, of $3.35



Patterns in Accuracy

Acme Pattern Company, Pittsburgh, makes patterns for all types of machines, valves, rolling mill equipment and heavy bridges. Three 20-in. band saws are included in the company's wood working shop equipment; all three of the saws are mobile. In other words, wherever cutting operations are needed the saw is moved to that spot and the required operations are performed on the job to be done. The itemized cost of operating a 20-in. bandsaw two hours per day, including depreciation, interest, maintenance, repair, power cost and labor, is $2.40 per hour, according to Acme's figures

Industry Leaders Tell Scrap Need–"Get in the Scrap!"

PLANT ENGINEERING in its September, 1951 issue, published detailed information on scrap and salvage operations in six of the country's industrial, commercial and Governmental installations. That the operation is a paying proposition was pointed out in each of these cases. The situation resolves itself, now, into one of far greater proportions than profit, although that is also important to our economic system; it is now in the realm of National security.

Following are letters from industrial leaders; men in high positions in some of the country's greatest corporations. Three of them are from steel-producing companies; the other two are from steel-consuming companies. All of them tell the same story: that scrap is urgently needed if we are to maintain our ever-growing rate of production.

Allegheny Ludlum

"If there is a shortage in the steel industry more critical than scrap it is the shortage of various alloying materials which go into the production of high alloy steels. We producers are doing everything in our power to conserve and 'stretch' such alloying materials as nickel, columbium, molybdenum and tungsten.

"High alloy users can be most helpful by carefully segregating scrap of known analysis containing these elements and returning it to their suppliers. This will not only add to the short supply of these materials but will also prevent this alloy scrap from causing annoying contaminations by its use for regular steel."

EDWARD J. HANLEY
PRESIDENT

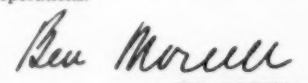
Jones & Laughlin

"I am glad to take this opportunity to make a statement regarding the critical nature of the scrap shortage.

"During the latter part of 1951 the shortage of scrap in many steel mills was a very serious problem and added materially to the difficulties of maintaining maximum production of steel products which are sorely needed for defense and our civilian requirements.

"The increased steelmaking capacity which will come into production during 1952 will further increase the requirements for scrap, if maximum production from all existing facilities is to be expected. Thus the necessity for additional scrap being returned to the mills becomes even greater. During the winter months, when obsolescent scrap is more difficult to obtain, the situation is even more critical.

"Every operator and plant manager can contribute materially to the alleviation of this shortage by "cleaning house" and returning to the steel mills every piece of ferrous metal not essential to his current operations."



BEN MOREELL
PRESIDENT

Gardner-Denver

"We have had a program for the reclamation of scrap iron, steel, bronze, brass, babbit and other materials for well over a year and are very pleased to advise just how we go about reclaiming our scrap.

"We have a committee which rejects all obsolete parts or parts on which we are over-supplied for our compressors and pumps and determines how many shall be scrapped and returned to the foundry or to the steel storage department for use in additional castings or parts.

"Our entire salvage and scrap program is under the direct supervision of Mr. Arthur Schutte who is also a member of a committee to determine the obsolescence of parts.

"During the past year we have completed the following projects toward the reclamation of scrap.

"1. We have disassembled and used the material from our old obsolete electrical motors.

"2. We have reclaimed copper wire throughout the plant as a part of our rewiring program and installing new lighting equipment.

"3. We have scrapped all our old machine tools and other pieces of operating machinery and have turned the materials over to our foundry to use after such parts as gears and roller bearings on special shafts have been salvaged and placed in our machine tool repair department.

"4. We have cleaned up our entire premises and during our vacation period reclaimed about sixty tons of scrap iron and steel which has been turned over to our foundry for material.

"5. We sell all steel and iron chips each month to our local scrap dealers.

"6. We save all grindings from our cylinder and internal grinding machines and sell the grindings to our local scrap dealers.

"7. We salvage all obsolete aluminum patterns and save the aluminum for the making of additional patterns, core boxes or core dryers.

"8. We reclaim all structural steel that we possibly can.

"9. We purchase steel bars and shafts and railroad car axles from scrap dealers and have a chemical analysis made from this class of steel scrap.

"10. After checking the chemical composition of scrap steels, we quite frequently use this steel as material to make shafts, gears or pinions for our equipment and heat treat them according to the accepted practice for the grade of steel which they are.

"11. Our Scrap Committee has sold quite a lot of obsolete material back to the original suppliers due to the fact that the original suppliers had use for this material for some other customer.

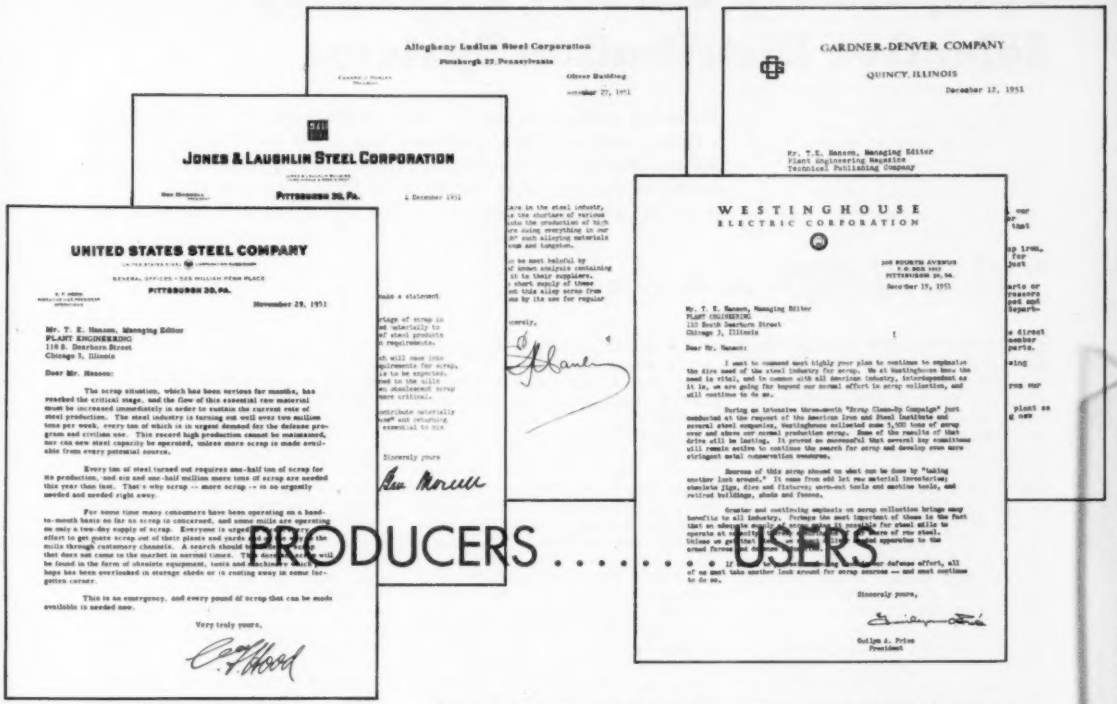
"12. We have organized a plant-wide maintenance program with a common maintenance department stock room so that we will not have the same size bearing kept in more than one place for maintenance purposes.

"13. We have scrapped and remelted all unused jigs, fixtures, and dies that our Scrap Committee has declared obsolete.

"14. On cutting tools, drilling bushings and high speed drills, taps or carbide tools are removed from any jig, fixture or tool and are saved for use in some new tool."

ROBERT WILLIAMS
WORKS MANAGER

Urge Plant Engineering Readers to


Allegheny Ludlum Steel Corporation
Pittsburgh 22, Pennsylvania
Oliver Building
JONES & LAUGHLIN STEEL CORPORATION
Pittsburgh 30, Pa.
GARDNER-DENVER COMPANY
QUINCY, ILLINOIS
December 17, 1951
Mr. T. E. Hanson, Managing Editor
Plant Engineering Magazine
Technical Publishing Company
WESTINGHOUSE
ELECTRIC CORPORATION
306 FOURTH AVENUE
P. O. BOX 1017
PITTSBURGH 30, PA.
December 19, 1951
Mr. T. E. Hanson, Managing Editor
PLANT ENGINEERING
120 South Dearborn Street
Chicago 3, Illinois
Dear Mr. Hanson:
I want to commend most highly your plan to continue to emphasize the dire need of the steel industry for scrap. We at Westinghouse know the need is vital, and in common with all American industry, interdependent as it is, we are going far beyond our normal effort in scrap collection, and will continue to do so.
During an intensive three-month "Scrap Clean-Up Campaign" just conducted at the request of the American Iron and Steel Institute and several steel companies, Westinghouse collected some 5,500 tons of scrap over and above our normal production scrap. Some of the results of that drive will be lasting. It proved so successful that several key committees will remain active to continue the search for scrap and develop even more stringent metal conservation measures.
Sources of this scrap showed us what can be done by 'taking another look around.' It came from odd lot raw material inventories; obsolete jigs, dies and fixtures; worn-out tools and machine tools, and retired buildings, sheds and fences.
Greater and continuing emphasis on scrap collection brings many benefits to all industry. Perhaps the most important of these is the fact that an adequate supply of scrap makes it possible for steel mills to operate at capacity, thereby assuring us our share of raw steel. Unless we get that steel, we cannot deliver needed apparatus to the armed forces and defense industries.
If we are to prevent a slowing down in our defense effort, all of us must take another look around for scrap sources — and meet continue to do so.
Sincerely yours,
Gwilym A. Price
President
UNITED STATES STEEL COMPANY
GENERAL OFFICES - 525 WILLIAM PENN PLACE
PITTSBURGH 30, PA.
November 29, 1951
Mr. T. E. Hanson, Managing Editor
PLANT ENGINEERING
120 S. Dearborn Street
Chicago 3, Illinois
Dear Mr. Hanson:
The scrap situation, which has been serious for months, has reached the critical stage, and the flow of this essential raw material must be increased immediately in order to sustain the current rate of steel production. The steel industry is turning out well over two million tons per week, every ton of which is in urgent demand for the defense program and civilian use. This record high production cannot be maintained, nor can new steel capacity be operated, unless more scrap is made available from every potential source.
Every ton of steel turned out requires one-half ton of scrap for its production, and six and one-half million more tons of scrap are needed this year than last. That's why scrap — more scrap — is so urgently needed right away.
For some time many consumers have been operating on a hand-to-mouth basis so far as scrap is concerned, and some mills are operating on only a two-day supply of scrap. Everyone is urged to strain every effort to get more scrap out of their plants and yards and on the way to the mills through customary channels. A search should be made for scrap that does not come to the market in normal times. This dormant scrap will be found in the form of obsolete equipment, tools and machinery which perhaps have been overlooked in storage sheds or is rusting away in some forgotten corner.
This is an emergency, and every pound of scrap that can be made available is needed now.
Very truly yours,
C. F. Hood

PRODUCERS . . . . . USERS

Westinghouse Electric

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GWILYM A. PRICE
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United States Steel

"The scrap situation, which has been serious for months, has reached the critical stage, and the flow of this essential raw material must be increased immediately in order to sustain the current rate of steel production. The steel industry is turning out well over two million tons per week, every ton of which is in urgent demand for the defense program and civilian use. This record high production cannot be maintained, nor can new steel capacity be operated, unless more scrap is made available from every source.

"Every ton of steel turned out required one-half ton of scrap for its production, and six and one-half million more tons of scrap are needed this year than last. That's why scrap — more scrap — is so urgently needed right away.

"For some time many consumers have been operating on a hand-to-mouth basis so far as scrap is concerned, and some mills are operating on only a two-day supply of scrap. Everyone is urged to strain every effort to get more scrap out of their plants and yards and on the way to the mills through customary channels. A search should be made for scrap that does not come to the market in normal times. This dormant scrap will be found in the form of obsolete equipment, tools and machinery which perhaps have been overlooked in storage sheds or is rusting away in a forgotten corner.

"This is an emergency, and every pound of scrap that can be made available is needed now."

C. F. Hood

C. F. HOOD
VICE PRESIDENT/OPERATIONS

Comparative Costs of Secondary Selective Distribution Systems

Trends in standardization of circuit arrangements . . . Employing a typical radial circuit arrangement load center distribution system as 100 per cent of cost, or the standard, the author presents other typical arrangements, tells their advantages and disadvantages, and compares their cost with the standard . . . Use of automatic transfer system

By D. L. BEEMAN, Manager
Industrial Engineering Division, General Electric Co.

BECAUSE MANY smaller load center substations are used in the load center system, there naturally are various circuit arrangements in which this multiplicity of substations can be connected into a system. During the past ten years in which load center power distribution became the accepted standard system for distributing power in industrial plants, there have developed certain trends in the standardization of these circuit arrangements.

First, the simple radial system, Fig. 1, using single-ended load center unit substations, Fig. 2, is by far the most popular. It is the simplest, lowest cost, and is easy to expand and operate. This system does lack some flexibility from the standpoint of maintenance of equipment, and if a failure should occur, service normally supplied over the failed system is dropped until the failure is repaired.

Where slightly greater flexibility and the ability to take a feeder or transformer out of service without dropping load for extended periods is desired, the simple radial system can be modified with a normally open tie between pairs of substations or double-ended substations used to form a secondary selective arrangement, Fig. 3. The two substations normally operate as straight radial substations.

In case one primary feeder or transformer is purposely or inadvertently taken out of service, the load normally supplied by these substations is supplied from their "partner" by opening the proper main breaker "A" and closing tie breaker "B." If the load is too great for the remaining transformer, then some non-essential load must be dropped for the duration of the outage or some reserve transformer capacity provided.

This system is, in effect, two simple radial systems with a secondary tie between them. Thus, this system has all the appealing qualities of a simple radial system; i.e., safety, ease of operation, simplicity, good voltage regulation and can be cared for by the average electrician, plus the additional benefits of flexibility for operating purposes and theoretically somewhat greater service reliability because of the normally open secondary tie between substations.

As far as paying very much for any improvements of service reliability is concerned, one should consider that reliability of the straight radial arrangement is 99 per cent plus. Complication is increased only very slightly because the ties are normally open. Short circuits are not increased because the transformers are not paralleled. Cost is increased about from 10 to 31 per cent, depending largely upon the relative substation sizes and locations and the amount of reserve transformer capacity provided, and the exact form of the secondary selective arrangement used.

All through this text cost comparisons are referred to the radial system, Fig. 1, as a 100 per cent base. In Fig. 3 it is shown that provision of nearly 50 per cent reserve transformer capacity increased the cost from $45 to $51 per kva or about 13 per cent.

In popularity, the secondary selective load center system ranks second to the radial load center system and accounts for most of the other load center power distribution systems which are not radial. It has been used in about every kind of manu-

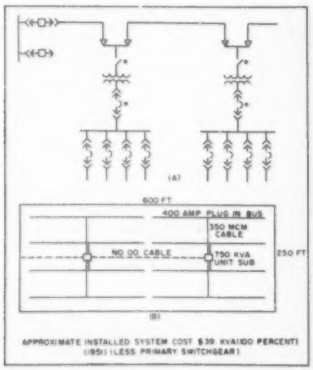


Fig. 1. Typical radial circuit arrangement load center distribution system. A: one line diagram. B: layout in plant

Fig. 2. Single-ended unit substation typical of those used with radial load center

facturing plant and has met the most exacting requirements of the most critical processes in chemical plants, paper mills, steel mills, petroleum refineries, drug manufacturing plants, and others.

Spot Secondary Selective

The secondary selective arrangement can be put together in several forms. A one-line diagram of the spot arrangement is shown to the right in Fig. 3 and a photo of a typical double-ended substation is shown in Fig. 5. Pairs of single-ended substations located side by side with a bus tie as in Fig. 4 may also be used.

The spot secondary selective arrangement is simple and compact, as all interconnections and switching are at one location for any pair of unit substation transformers. It is generally slightly lower in cost (109 per cent compared with 115 per cent or more) than other forms using distributed single-ended substations. The two single-ended units provide the advantage that extra secondary circuits can be added easily. In the double-ended arrangement provision must be made in the beginning for the extra secondary feeder positions that may be required in the future.

Distributed Secondary Selective

Another form is the distributed secondary selective arrangement shown to the left in Fig. 3. In the distributed arrangement the substations serve smaller load areas, thus reducing the secondary feeder cable required. This saving is partially offset by the extra tie cable required. Many operators prefer this form for a new plant with the idea that as load grows another transformer can be added at each existing substation to form a spot secondary selective arrangement to provide for a load growth of 100 per cent in a given area. This arrangement costs about 115 per cent.

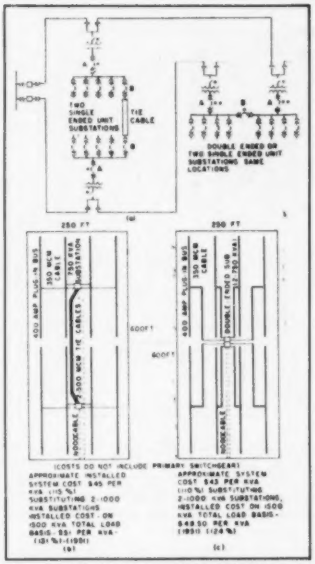

TWO SINGLE ENDED UNIT SUBSTATIONS
TIE CABLE
DOUBLE ENDED OR TWO SINGLE ENDED UNIT SUBSTATIONS SAME LOCATIONS
250 FT
250 FT
600 AMP PLUG-IN BUS
350 MCM CABLE
750 KVA SUBSTATION
350 MCM TIE CABLES
600 FT
600 FT
DOUBLE ENDED SUB 1,750 KVA
SWITCHGEAR
(COSTS DO NOT INCLUDE PRIMARY SWITCHGEAR)
APPROXIMATE INSTALLED SYSTEM COST $45 PER KVA (115 %) SUBSTITUTING 2-1000 KVA SUBSTATIONS INSTALLED COST ON 1500 KVA TOTAL LOAD BASIS $51 PER KVA (131%)-(100%)
APPROXIMATE SYSTEM COST $43 PER KVA (110%) SUBSTITUTING 2-1000 KVA SUBSTATIONS, INSTALLED COST ON 1500 KVA TOTAL LOAD BASIS - $49.50 PER KVA (100%) (126%)
(a)
(b)

Fig. 3. Typical secondary selective arrangement of load center distribution. A: one line diagram. B: layouts in plant

The common tie secondary selective arrangement, Fig. 6, is another form. This arrangement has the advantage that when one transformer or feeder is out, the load on its secondary bus can be picked up on any other secondary bus; thus one could select the bus that had the least load on it for carrying the load of the bus on which service had been lost.

This arrangement has the disadvantage that it costs more compared with the foregoing arrangements (121 per cent vs. 110-115 per cent), all costs without reserve transformer capacity. It is complicated and cannot be easily interlocked to prevent paralleling transformers. Transformers should not be paralleled unless the secondary switchgear has been selected with that in mind, as the number of transformers paralleled at one time materially affects the interrupting duty on the secondary switchgear.

To safely parallel transformers, the secondary switchgear should have interrupting ratings equal to or greater than the maximum short-circuit current available when the transformers are paralleled. Expansion of this system may be difficult because whenever substations are added, the common tie must be broken into and expanded.

Extended Secondary Bus Secondary Selective

Another form of the secondary selective arrangement is shown in Fig. 7. This constitutes only one main heavy feeder (extended secondary bus) with the plug-in busway tapped off it. This system has all the features of the systems of Figs. 8 and 3. The main feeder bus must be heavy enough to carry normal load current plus the transfer current when one substation is out. The normally open tie breaker and the bus tap breakers should be electrically operated from the floor if these breakers are not easily accessible, as they often are not in this system.

Inaccessibility of the bus tap and tie breakers increases the difficulty of maintenance. A main feeder bus fault will put one station and all load served from it out of service. The secondary selective arrangement does no good in this case. This arrangement without reserve transformer capacity costs about 110 per cent when using manually-operated tie and bus tap breakers. This cost is comparable with the conventional distributed secondary selective arrangement which costs 110 per cent also.

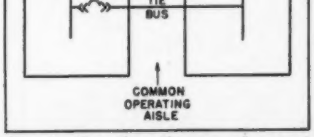


Fig. 4. One line diagram of a spot secondary selective arrangement using two single-ended load center unit substations connected through a tie bus

Fig. 5. Typical double-ended load center unit substation which may be used in a spot secondary selective system. Diagram of spot arrangement shown in Fig. 3

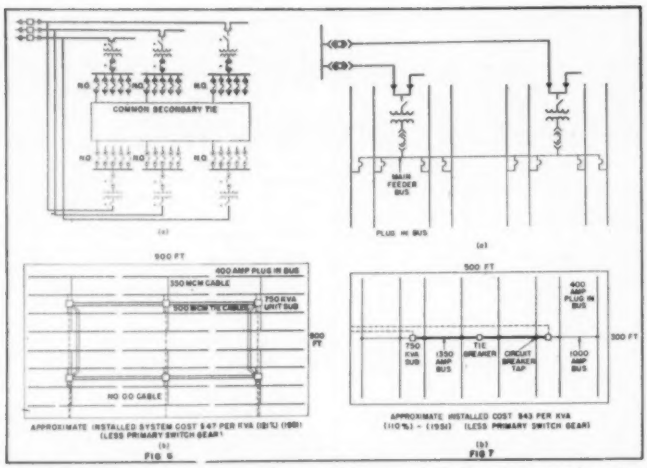


Fig. 6. Left: Common tie secondary selective arrangement of the load center distribution system. A—one line diagram. B—layout in plant. Fig. 7. Right: Extended secondary bus form of the secondary selective load center distribution system. A—one line diagram. B—layout in the plant. Only one main feeder here

In some industries, particularly material fabricating plants, there may be seasonal shifts of load due to moving of major machine tools which could occur when production lines are changed or when there is a change in model or type of product produced. Such plants generally employ plug-in busway for distributing the power to utilization equipment.

If they do employ plug-in busway and have a substation capacity of 10-15 volt amperes per square foot of floor area available, experience has shown that this will provide adequate power and flexibility to care for load shifts that take place in practically all material fabricating plants.

In any radial type load center system such as the radial or secondary selective arrangements, more extensive load shifts can be cared for by the following method, Fig. 8 same system as shown in Fig. 3).

For example, if the load on Substations 1 and 3 becomes heavier and the load on Substations 2 and 4 lighter, then the plug-in busway separation point can be moved from Point A to Point B, thus covering a greater area with Substations 2 and 4. On the other hand, the load may increase on Substations 1 and 2 and decrease on Substations 3 and 4. Adjustment of load can be made by merely connecting some machine tools which were formerly connected to Bus A to Bus B, thereby shifting load from one side of the plant to the other.

In another case, the load may increase on Substation 1 and decrease on Substation 4. In such case it may be necessary to run an additional Feeder 1 from Substation 4 to pick up a bus section formerly served by Substation 1.

A special form of the secondary selective arrangement shown in Fig. 9 has normally open circuit breakers between feeders. Upon the outage of one substation the main breakers and feeder breakers are opened and the normally open circuit breakers at the center of feeder system are closed.

This is more complicated to interlock and has the disadvantage of possible inadvertent paralleling of transformers as mentioned previously. It also requires twice as many secondary feeder circuits and circuit breakers as the conventional form, Fig. 3. If fewer feeder circuits are used, then they must be larger and spaced twice as far apart.

Based on using the same spacing of plug-in busway and using twice as many circuits per substation, this system is the most expensive of all secondary selective arrangements, being 131 per cent compared with 109-121 per cent for other forms—all without reserve transformer capacity. The location of the tie breakers is a major inconvenience, as in the system of Fig. 7, unless these breakers are electrically operated from the floor.

To shift load from Substation A to Substation B, open Feeder Breaker 1 at Substation A and close the normally open Tie Breaker 2. This can be repeated with other feeders until the desired balance is reached.

A modification of the form of the secondary selective arrangement shown in Fig. 9 is shown in Fig. 10. As in the system of Fig. 9, the plug-in busway in this system acts as both ties and feeders. However, since the normally open tie breaker in the center of each feeder is omitted, a circuit breaker at one end of each busway is left open. Normally each substation could carry about equal loads. This greatly simplifies the operation and maintenance problem compared with the system of Fig. 9 but still allows for transfer of load from substation to substation.

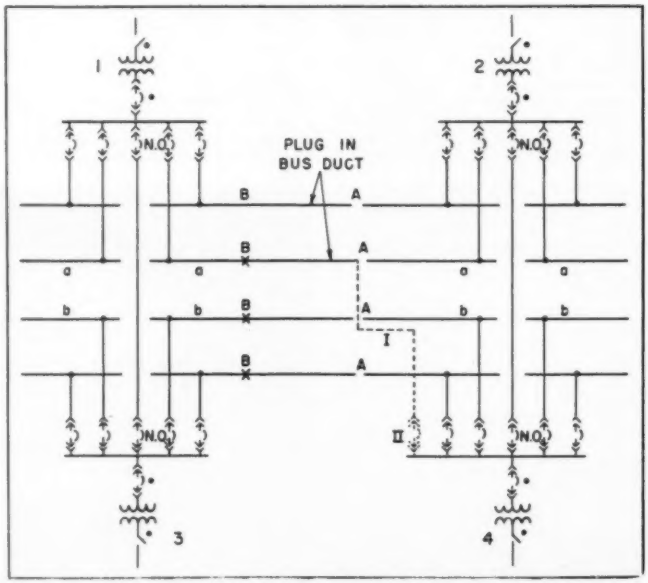


Fig. 8. Rearrangement of plug-in bus duct connections to permit shifting load

Assume that Substation B becomes overloaded and that Substation A is underloaded. The load could be easily shifted from Substation A to Substation B by opening Breaker 1, Substation B, and closing Breaker 4, Substation A. Thus, it is easy to shift load from a substation to its neighbors by merely opening one circuit breaker and closing another.

In another case supposing Substation B was overloaded and Substation A could not accept more load, but Substation C could. The load could be shifted from Substation B to C in the following manner. Open Breaker 1 in B, and close Breaker 4 in A. Now A is overloaded. To relieve A, open Breaker 2 in A, close Breaker 6 in C. Load can be transferred anywhere around the loop, and it is done without carrying the load a long way on low-voltage tie circuits. The transfer actually is carried on the primary circuit.

While the arrangements of Figs. 9 and 10 possess great flexibility in respect to load shifting, they are complicated and the secondary circuit breakers cannot easily be interlocked to prevent paralleling transformers. If transformers are inadvertently paralleled, then the short-circuit currents may be in excess of the interrupting rating of the secondary switchgear unless unnecessarily expensive high interrupting rating switchgear is installed to handle the high short-circuit currents from paralleled transformers.

In these arrangements the secondary plug-in busways must be of ample size to carry normal load currents and current that may be transferred from one secondary bus to another when one transformer or primary feeder is out of service.

These arrangements are complicated in their operation when a transformer or feeder is taken out of service and the dead secondary buses are to be supplied from other energized secondary buses. To be sure the proper secondary breakers are operated, a good record must be kept at all times as to which secondary breakers are open and which are closed. The best solution would be to have the position of all secondary breakers remotely indicated on a dispatchers panel. The arrangements of Figs. 9 and 10 cost 131 and 122 per cent respectively.

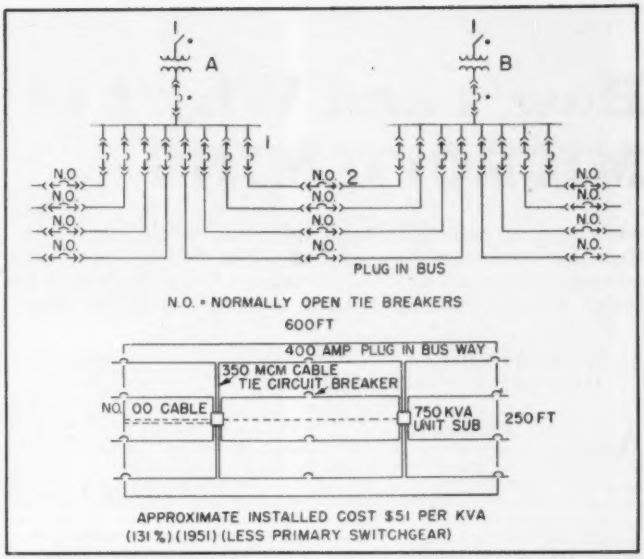


Fig. 9. Combined tie and feeder circuit form of the secondary selective load center with tie circuit breakers in busways. A—one line diagram. B—layout in plant

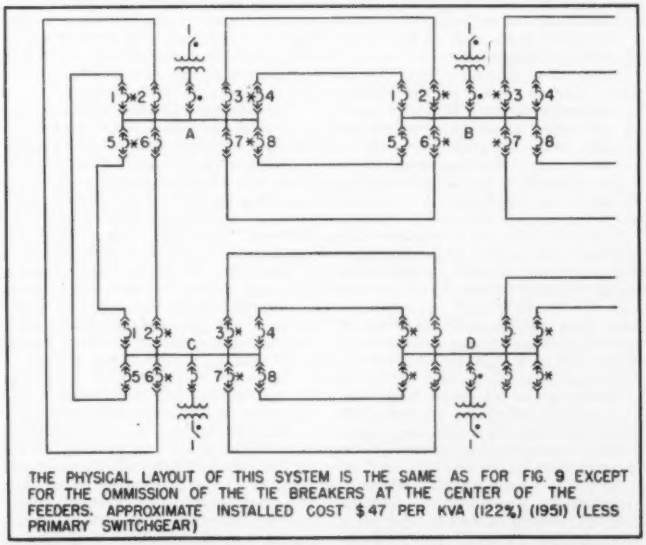

A
B
C
D
THE PHYSICAL LAYOUT OF THIS SYSTEM IS THE SAME AS FOR FIG. 9 EXCEPT FOR THE OMMISSION OF THE TIE BREAKERS AT THE CENTER OF THE FEEDERS. APPROXIMATE INSTALLED COST $47 PER KVA (122%) (1951) (LESS PRIMARY SWITCHGEAR)

Fig. 10. One line diagram of combined tie and feeder circuit form of secondary selective load center distribution system without secondary tie circuit breakers

Automatic Transfer Secondary Selective

Automatic transfer can be used to quickly disconnect a de-energized secondary bus from its transformer and connect the bus to its energized "partner" in the secondary selective arrangement. The automatic transfer can be designed to reconnect the system to normal when proper voltage is restored to the transformers that were out. The complication to do this is generally not warranted and manual restoration is used.

There are factors to consider in connection with the automatic throwover secondary selective arrangement. First, the system is very complicated and costly. Second, where the total load of one transformer is transferred to another transformer, depending upon the sum of the two loads, this may overload the one transformer too greatly. Third, it usually takes at least one second to make the transfer. This will allow motors to slow down or stop and when they are all re-energized at once, there may be a very large inrush which could cause tripping of the feeder circuit breakers.

This can be overcome by putting

(Continued on page 132)

How's and Why's of MICROFILMING

Advantages of microfilm: Space reduction; Record permanence; High-speed duplication; Low-cost duplication; Ease of collation and reference . . . Comparisons of costs between old-style filing and microfilming including: equipment, labor, space and safety of records

By **FREDERIC LUTHER**
Industrial and Technical Photographer

A DECADE AGO the scholarly field was startled by a study which showed that the collections in American research libraries were doubling in size every sixteen years, a geometric rate which had remained constant for over a hundred years. As yet, the records problem of industry has not been dramatized with such a study. Yet in engineering drawings and tracings alone the files in a typical medium-sized branch plant will double every eight years or less. Each day more manufacturing locations are turning to the solution reached by the research library: duplication of records in reduced form by photography, the well-established medium of microfilm.

To the modern keepers of records the advantages of microfilm are fivefold. 1. Space reduction; 2. Record permanence; 3. High speed duplication; 4. Low cost duplication; 5. Ease of collation and reference.

The replacement of bulky original record files by miniature film copies is by far the most highly publicized advantage of microfilm. One such file, a 70-year accumulation of records which must by law be retained, is currently being microfilmed, and the contents of the 65 file cabinets being transferred on film to 2 such cabinets. In another instance, 4800 tracings of various sizes are being filed on film in a space 12 in. by 12 in. by 1½ in. in size.

A little-recognized factor in records control is the cost of storage space. Recent studies have shown that in the reproduction department of one large plant the vandyke file alone takes up 4,325 sq ft of floor space. At a cost level of $1.6413 per sq ft this represents an annual space rental of $7,099. The cabinets themselves required to house 525,000 vandykes totaled $85,000; the annual increment of drawings required an expenditure of $3,000 per year for additional file cabinets.

In comparing the costs of maintaining a full-size file with the costs of housing the same material on microfilm, it was found that a total annual savings of $123,591.50 would be realized; this included a saving in labor cost, by reducing the file clerk staff from 13 to 3, of $30,790.

It is, however, much too easy to desire the ultimate in space reduction, to attempt too high a reduction ratio. After all, if the records are worth preserving, they must be usable. The short-sighted microfilmer who carried reduction past the resolving limits of the photographic emulsion, and the optical train in camera and reader, might just as well burn the film and preserve the ashes; they'll take up even less space.

Before buying a microfilming contract service, or installing his own equipment, the purchaser should have samples of his own records filmed at the proposed reductions and examine them under the conditions of anticipated use: on a microfilm reader or in the form of enlarged paper units.

There are several thumb rules which may be listed on the subject of reduction ratios. Material, such as cancelled checks, intended for infrequent consultation by means of a reader, may be photographed at high reductions of approximately 35 times; correspondence files are often reduced 24 times.

Originals carrying fine print, such as insurance policies and newspaper files, normally should not be reproduced smaller than 1/17 normal size for consultation on a reader. Any copy which may need to be re-enlarged to a paper print should be limited to the 10 to 21 times reductions; blueprints and drawings in fairly good condition and with no fine print often can be shot at 30 times reduction, but will reproduce better if photographed in sections in lower reduction ratios.

As is the case with all such generalizations, however, the specific body of records should be examined and possibly a sample run made to determine the proper technique to fit the problem. The conscientious microfilm company is more than glad to survey the client's requirements, discuss the various possible solutions, and make a demonstration run on the records themselves.

Record permanence is not limited to protection against fire and violence. Properly developed, fixed, washed and stored, a microphotograph will last equally as long as the base on which it is carried, whether that base is paper, glass, or film. The life expectancy of microfilm base has been described by the National Bureau of Standards as greater than that of permanent record papers. The author has in his possession a microphotograph made in 1870, and the image has never shown the slightest tendency to deteriorate.

There is still another aspect of the permanence factor. Since most American microfilm cameras are designed to take 100-ft rolls of film, each document appears within the roll in the exact relationship which it occupied in the file at the time of microfilming. Then the hazard of loss or misfiling is eliminated as long as the film roll remains uncut. True, a careless clerk can mislay an entire roll containing several thousand documents, just as she can misplace the boss's railroad ticket. But control over a properly marked roll of film is easy, where control over the contents of a loose-sheet file is not.

High Speed Duplication

As a means of quickly providing a duplicate copy of a corpus of records microfilm recognizes no equal. Professional equipment photographs the originals just as rapidly as they can be brought before the lens, collation is eliminated, and the fact that the copy is a photographic reproduction eliminates the need for time-consuming proofreading to catch errors in transcription.

For the past twenty years or so, microfilm cameras have been recording transient data on meters and gages in experimental power plants. They are whirring away in the dispatching yards of the nation's railroads, speeding LCL shipments through the yards. They recorded captured documents of technical and military nature in the wake of conquering Allied armies, and they preserved for us the priceless contents of the great English libraries at the very moment London found itself under the rain of fire bombs.

Accuracy and speed of recording is important, whether under the threat of destruction or in providing a duplicate file for a new plant location. But there is a practical limit to the speed of microfilm reproduction: if the war should warm up, the existence of a relatively few competent microfilm service companies and the shortage of precision equipment will make it impossible to protect all the irreplaceable rec-

ords of American industry. The time to fix the roof is now.

It is the speed and accuracy of microfilm which leads to the low cost of duplication. Yet no other attribute of microfilm has been promoted so over-enthusiastically and with such unfortunate results.

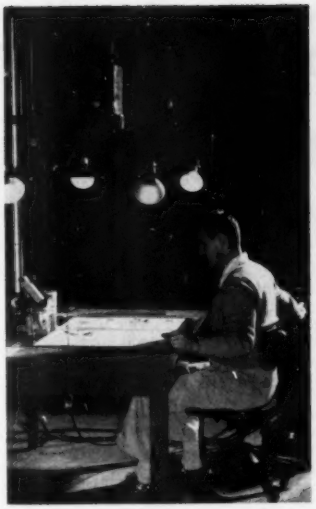
Microfilm is inexpensive only by comparison with other reproduction media, and in its corollary economics. A large corporation has for years been making comparative costs of the media. Utilizing company-owned 35mm equipment, and proceeding at a current rate of microfilming about 800 drawings per day, they reported costs averaging about 9 cents per drawing. Preparation, camera down-time, and inter- and intra-departmental loading are high in this instance, for the figure is roughly 50 per cent higher than the normal commercial contract rate.

There is no question that it is more expensive to prepare copy properly before filing. But a re-reading of the section above on Record Permanence will remind you that the location of a document within the roll of film cannot be changed, either misfiled or for the purposes of correct filing. To all intents and purposes, an incorrectly filed document on roll film is irretrievably lost; the cost of proper preparation of the files before microfilming will be repaid many times in future years. If the end product is unusable, then it is cheaper by far not to undertake the microfilm program at all.

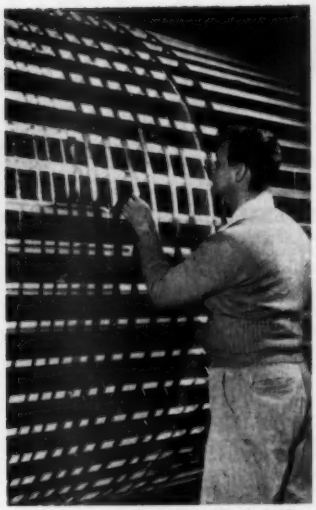
So far, this section has dealt entirely with the low cost of making a negative microfilm directly from the original records. Once the negative is made, however, any well equipped microfilm laboratory can make positive film duplicates from the negative immediately or at a future date, and the cost is but a fraction of the cost of the original film. On one recent job of small size, a West Coast client wanted copies of century-old, large size records held in a mid-western repository. The original filming cost $261.20; when the owner of the originals decided to buy and retain the film negative, a positive film duplicate was offered and sent to the original client at a cost of $49.35. Had the same number of records been smaller in size, the same $49.35 would have replaced a bill for over $500.

Collation and Reference

The sections on Record Permanence and Low Cost Duplication described the fixed collation advantages of microfilm in roll form. Where inactive records will be searched on a book-and-page, alphabetic, numeric, or geographic basis, roll microfilm is normally the preferred form. Various means of indexing are used: the Defense Department pioneered the photographing—at predetermined intervals—of signal cards of a width and pattern quite different from that of the body of documents. The flash of such a signal on the screen while scanning the film indicates that a new section of the record is at hand, a section described in the index on the film carton.



One type of camera used for copy work



Photos: U. S. Microfilming Corp.

Drying frame used in processing of film

Another approach is to mount a simple gage on the reading machine, and index the documents according to their position from the start of the film. An elaboration of this was incorporated in a reader some years ago, whereby the searcher could pre-set a control panel for, say, document number 1346, and the motor-driven film would stop automatically at the desired place.

In line with the needs of business and industry in the rapid reference to active records on microfilm has been the development of the card filing system. Here the film is cut (preferably a positive duplicate copy, leaving the original microfilm negative intact in roll form for replacement of misfiled and lost copies) and mounted on a standard file-size card, either in a transparent sheath or over a die-cut aperture.

The individual frame or short strip is then read in a special card reader. The cards themselves may carry typed indexing information or be coded for use in tabulation machines or for hand or mechanical sorting methods. The beauty of this method is that it permits interfiling of change sheets and so keeps the microfilm file current.

Basically, professional microfilm cameras fall into two distinct categories. The flat-bed, or planetary, camera is usually mounted on a column which rises from the copy board. The film width may be 16, 35, or 70mm, with the preponderance of usage falling on 35mm. Roll size is pretty well standardized at 100-ft lengths.

Although several attempts have been made to introduce mechanical feeding of copy, documents normally are placed on the copy board by hand. The microfilming of large bound volumes usually can be speeded by use of an oscillating book cradle, whose split platen compensates for the varying thickness as the operator proceeds through the book. Reduction ratios are usually in the order of 8 to 21 or 30 times. The price range on this type of equipment is from $1,500 to $5,000.

The rotary camera is a cabinet-housed unit which normally operates with 16mm film, although some units are available which take the 35mm size. Roll lengths may be 100 or 200 ft, nearly always winding up eventually on 100-ft spools. As contrasted with the flat-bed camera, where film and copy are stationary during exposure, the rotary camera moves the film past an exposure slit in synchronism with the movement of the paper document. Various manufacturers supply such refinements as mechanical feeders, double-document stops, light failure alarms, double camera takeoff for making a duplicate film copy immediately, and printer-enlarger attachments. Reduction ratios are usually in the order of 23 to 35 times. Price range is from $2,000 to $6,000.

The rotary camera is normally limited to unbound, de-stapled copy not exceeding 11 or 14 in. in width; one company, however, has a 35mm version which accepts originals up

(Continued on page 139)

COMPRESSED AIR SYSTEMS—

For the Unit System:

By **LESLIE B. SCHRAMM**, Secretary
Schramm, Inc., West Chester, Pa.

A CENTRAL SYSTEM of compressed air supply consists of a large capacity air compressor installed in one part of an industrial plant—frequently the boiler room or special compressor room—with the compressed air piped to all points of use throughout the plant.

The unit system, on the other hand, consists of two or more compressors whose capacity equals or exceeds the capacity of a central system. The compressors might be located in a central point, or might be scattered throughout the entire industrial plant.

Frequently the central system consists of a large horizontal compressor, of capacities from 150 hp on up to 1000 hp, or over. On the other hand, the unit system usually consists of so-called vertical compressors that may either be vertical or "V" construction, single-stage or two-stage, air or water cooled, in capacities of 15 hp to 150 hp.

Naturally the total capacity required by the industrial plant will determine the total air capacity, and the total electrical horsepower required by such compressor installation. Larger horizontal compressors might be used in a unit system where a large capacity of air is required. Likewise, one of the small vertical compressors of 150 hp, or less, might be used as a central air supply, in a smaller plant. For the sake of simplicity we will discuss the average industrial installation where the central system does use horizontal, large capacity compressors, and where the unit system incorporates the vertical type of compressors up to 150 hp.

The perfect compressor installation is one that has the lowest initial cost, including installation cost, and has the lowest maintenance and operating cost. Another important factor to be considered in deciding upon a compressor installation is its flexibility to meet changing needs of plant production with the least expense and confusion.

Taking these factors one by one, let us discuss first the lowest initial investment: In the central system it is necessary to set aside a room or area that is to be considered the compressor room; ample expansion space must be provided for additional installation in the future as the plant grows or production increases. Thus, much waste space is usually found in the typical compressor room or boiler room of a growing organization.

Foundations required for the large horizontal compressors usually cost approximately the same amount of money as the compressor itself, because they must be so constructed as to reach solid footings. Frequently this requires a mass of concrete in excess of the weight of the compressor; sometimes requires that the foundation go down to bed rock. Or, piling must be driven. This cost of foundation, plus the cost of erection, brings the initial cost of a large capacity compressor plant to almost double that cost of a unit system, consisting of packaged compressors such as the 15 hp to 150 hp vertical machines.

Most manufacturers of the vertical compressors build them as complete units, requiring only a simple foundation such as might be poured to raise the unit above the floor level, as an aid in keeping the entire unit neat and clean. Some manufacturers produce vertical compressors that require no foundation whatsoever, merely a leveling operation and grouting before bolting down to prevent creeping. The large horizontal compressors require skilled engineers to assemble and line up the many parts on the foundation.

Since the vertical compressors are normally shipped completely assembled by the manufacturer they require only pipe fitting and electrical work to complete the installation. They can be transported into the plant on standard material handling equipment such as lift trucks. They can be set in place, grouted, bolted down, and be ready for use in a matter of hours. Expensive erection crews required with the horizontal compressors are not necessary with the vertical type units.

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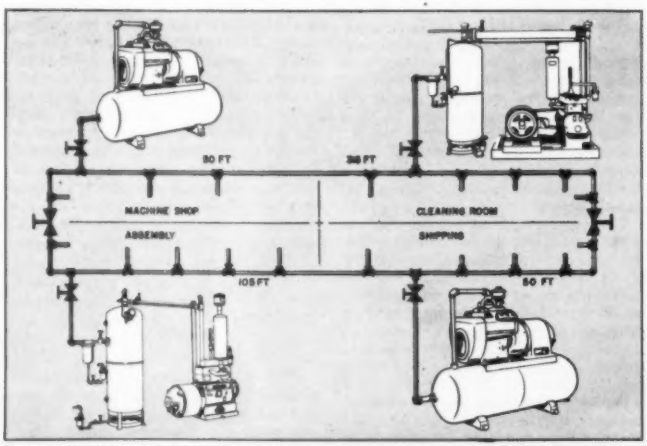


Schematic diagram of typical unit compressed air system. Note the valving which permits the complete isolation of any part of the compressed air system

Leslie B. Schramm

Leslie B. Schramm was born in 1917 and was raised in West Chester, Pennsylvania, where he attended public schools. He was graduated from Haverford College with a degree of Bachelor of Science. In 1938 he became a member of Schramm Inc., and was elected Secretary of the firm in 1939; he has been the company's Sales Manager since 1949. At present he holds the position of Chairman of the Committee on Engineering Education of the Compressed Air and Gas Institute.

Which One Will Serve YOU Best?

For the Central System:

By W.H. WHEELER, Manager, Vertical Compressor Division
Worthington Pump and Machinery Corporation, Holyoke, Mass.

THE PRUDENT plant engineer will give careful study to the kind of compressed air system that will best assure an adequate, continuous and economical flow of compressed air to his production facilities. In general he will make a selection between the two following systems: 1. A central system, consisting of one or more relatively large compressors located at one central point in the plant, or 2. A unit system, consisting of numerous relatively small compressors located throughout the plant at points where compressed air is required and usually interconnected.

The advantages of the central system over the unit system are: 1. Total investment per unit of capacity is less; 2. Cost of power per unit of air compressed, under normal load conditions, is less; 3. Compressors usually employed in the central system lend themselves to synchronous motor drive (for power factor correction) whereas compressors of the size used in the unit system do not; 4. The co-ordinated control of the central system assures maintenance of more uniform plant air pressure, held within closer limits, contributing to greater production efficiency; 5. Less wiring is required throughout the plant.

Initial Cost

It is axiomatic with air compressors, as with electric motors, gasoline engines, domestic refrigerators and tubes of tooth paste that the larger the size, the lower becomes the cost *per unit of capacity.* As an example, one 10 hp, 1750 rpm standard open polyphase electric motor at current prices will cost about 17 per cent less than two 5 hp motors of like specification and 70 per cent less than ten 1 hp motors. These differences represent initial cost savings of 17 per cent and 70 per cent respectively per unit of capacity.

Since the motor drive represents a considerable portion of the cost of a compressor installation for the average industrial plant, an initial cost penalty due to the motor alone is imposed on the purchaser who breaks up his compressor capacity into relatively small units. Coupled with this is a like penalty for the motor control, the air receiver and the aftercooler as well as for the compressor itself. The net result is that four 25 hp compressor installations will cost about 50 per cent more than one 100 hp compressor installation; five 100 hp installations will cost nearly 50 per cent more than one 500 hp installation, etc.

It is not intended here to imply that good practice necessarily dictates that only one large compressor should be employed to provide plant air. Two units (often duplicates) in a central system with total output adequate to meet maximum sustained demand provide greater flexibility in capacity and give insurance against complete interruption of air supply. Furthermore, the additional cost of two baskets for the eggs instead of one is quite nominal. For example, two 50 hp compressor installations will cost only about six per cent more than one 100 hp installation; even two 500 hp compressors will cost under ten per cent more than one 1000 hp compressor.

Power Cost

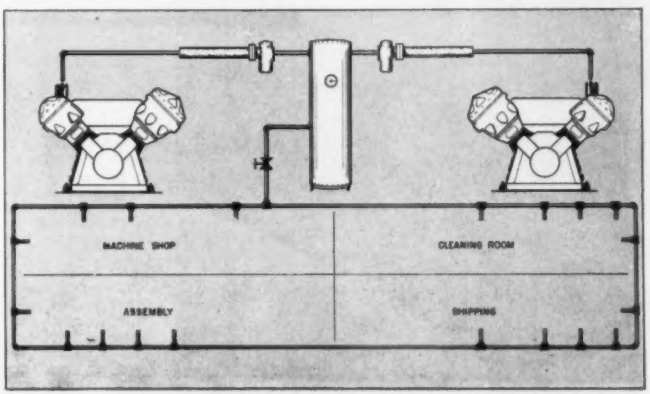
Even more important to the economy of the compressed air system than initial cost is the operating cost of the compressor in terms of power consumed. The only purpose of a compressor is to transform power from one form, usually electrical energy, to another form of power, compressed air. The efficiency with which this transformation is accomplished depends to a large degree on the size of the transforming equipment or the compressor. The high efficiencies of relatively large compressors assure low power costs or low air costs.

Conversely, if the compression of air is broken up into many small machines with lower efficiencies than their big brothers, power costs and air costs will be higher. Not only the efficiency of the compressor, but the efficiency of the driver as well plays a major role in the drama of power costs. Here again, driver efficiency increases with size. And the efficiency of synchronous motors commonly used to drive large com-

(Continued on page 77)

W.H. Wheeler

W. H. Wheeler was born in Storrs, Conn., and attended public schools in that state. He was graduated from Yale University in 1923 with a Bachelor of Science degree. Since that time he has been associated with the air compressor industry in many capacities from student engineer and sales engineer to his present position as Manager of Vertical Compressor Division, Worthington Pump and Machinery Corp. At present he is chairman of the Educational Committee of Compressed Air and Gas Institute.



Schematic diagram of a typical central compressed air system. Here, air is available to all parts of the manufacturing plant from one compressor room

UNIT SYSTEMS

The special compressor room that it required in the central system is not necessary when using the unit system. If the several vertical compressors are to be installed in one central location with air piped to the various plants, the units may be set in out-of-the-way corners of existing building space. There is but one requirement: that the area be clean and that a supply of clean, fresh air be available. Usually this is accomplished by piping the air directly to the compressor intake in such a fashion that contamination from surrounding room conditions cannot take place. On the other hand, the large horizontal compressors, normally used in the central system, do require expensive intake filtering systems and expensive underground ducts.

Proximity Important

In the unit system the compressors may be located close to the point of use of the compressed air. For example, in a typical industrial plant an operation such as paint spraying may be done in one section of the building, or in a separate building. If the proper compressor capacity is available at this point it is started only when paint spraying is being done, and is turned off when the paint spraying is completed. Likewise, in the same plant there may be a sandblasting operation and the same rule would apply. On the production line there may be occasion for a heavy load during the daytime, and a light load during the night shift. Several compressors may be installed near a production line and only the proper number operated to take care of the load at the time.

Elimination of large size compressed air lines cuts down initial investment, and eliminates the loss of pressure through the transmission of air over long distances. In most unit systems the compressors are interconnected with smaller pipe so that if any one department in the industrial plant requires additional air it may be "borrowed" from other compressor capacities.

Economical Operation

The second important factor to be considered is the saving of money in the operation of the compressor. A large central system, consisting of a single compressor, must of necessity operate at all times regardless of the amount of compressed air being used. As long as any air is required the entire unit must operate. Large horizontal compressors have step controls that unload in three or five steps so the production of air is kept balanced with the demand. The losses when operating a large compressor at light load are very great. An electric motor operating an unloaded compressor will consume nearly 50 per cent as much current as when fully loaded, and when operating partially unloaded an excessive amount of current is consumed.

On the other hand, the vertical compressors normally used in the unit system can be equipped with automatic start and stop equipment and set at the proper pressure range so that one after another cuts in as the load increases, and one after another drops out as the load decreases; each compressor operates at maximum efficiency and with minimum current per cubic foot of air compressed. If the compressors are scattered throughout the plant, as described above, the operator in each department can start or stop the unit as his need occurs.

This photograph illustrates a compressor as it might be used in a unit system where the compressor is located close to the job. This is a 25 hp unit (105 cu ft actual air delivery) complete with intake silencer, aftercooler, self-contained cooling unit, air receiver, and an automatic start and stop control

Frequently in the unit system, plants are so small that the compressors may be set side by side in a central location, and only the proper number of units operated at any one time to take care of the demand for air. This can be done automatically, or can be under the control of the plant engineer. This advantage applies whether they are located at one point, or whether the compressors are scattered throughout the plant. This depends entirely upon the floor area and layout of the plant itself. A small industrial plant may have need for large quantities of air under certain peak conditions, in which case two compressors are operated. Or, its normal load may require but one compressor.

Preventive Maintenance

Proper preventive maintenance of compressors is extremely important, regardless of the type or design of unit. When using the unit system any one compressor may be shut down for inspection, minor repairs, or complete overhaul, without affecting the total capacity of the plant to any appreciable extent. By interconnection with proper size pipe any one department can borrow its air from other departments during such inspection, minor repair, or major overhaul. Likewise, when some damage occurs through neglect, wear, or for any reason, the cost of replacing a part or piece on the small unit is very much lower than the cost of replacing a similar part or piece on the large unit.

In the modern production plant extreme flexibility of arrangement of equipment is necessary in order to maintain the best production flow. Frequently a plant may be operating on one type of material or equipment and have a certain production line set up. In changing over to a different type of equipment, or different product, an entirely different flow of production material may be necessary. The use of the unit system permits the easy shifting of compressed air capacity directly to the point where it is required. Whereas, the use of a central system requires, in many cases, complete re-piping requiring additional material and considerable manhours.

The central system and the unit system may be compared to scaffolding used in maintenance and repair of a building. The central system would be comparable to a scaffolding that is made up from welded pipe; it becomes so big and cumbersome that it can be used for the one

(Continued on page 78)

pressors of the central system is noticeably greater than induction motors driving small compressors used in the unit system.

This point can be illustrated by assuming that 2750 cfm free air compressed to 100 psig is required to meet plant demand. The amount of power and its cost for compressing this quantity of air are shown in Table I.

It should be noted that no charge has been made against either system to cover power transmission losses between motor and compressor. Compressors in the sizes cited in the table above under the central system are invariably direct connected to electric motors, so there is no such loss. However, in the sizes cited for the unit system, belt drive is frequently employed which will add extra power consumption to overcome transmission loss; even if direct driven, motors employed generally operate at 870 rpm or 1150 rpm with efficiencies usually lower than for the 1750 rpm motors cited.

Synchronous Motor Drive

Air compressors of relatively large size invite many improvements and often considerable cost savings in the plant electrical system through the use of the synchronous motor drive. The resulting improvement in power factor assures better maintenance of voltage level in the plant, reduces slip in induction motors, adds to lighting efficiency and reflects savings in power cost.

Savings in power cost by power factor correction within the plant usually come about because of reduction in demand charge. It is the practice of many power suppliers to make a demand charge based on the peak kva load or the reactive kva. Therefore any device which improves power factor, reduces the kva peak and the demand charge. The synchronous motor driven compressor is one device that does just this.

Assume a plant has an existing peak load of 800 kw at 80 per cent lagging power factor or 1000 kva. With a demand charge of $1.25 per kva per month, the plant is billed $1250 each month to cover demand. If the plant adds 400 kw at 80 per cent lagging power factor to its load to drive air compressors using induction motors, it will increase the demand charge by 500 kva adding another $625 per month to its demand charge. However, if the 400 kw added compressor load is in synchronous motor drive, the power factor will be improved from 80 per cent to 89.5 per cent and the kva will become 1342 instead of 1500, representing a saving of $197.50 per month in demand charges. Such saving is possible with unity power factor synchronous motor drive. However, if a synchronous motor having 80 per cent leading power factor is employed, the power factor will be brought up to 96.8 per cent and kva demand reduced to 1240 showing a savings in demand charges of $325 monthly, compared with the same load added by induction motors.

Synchronous motors for driving compressors smaller than 100 hp are seldom used because they are costly and require accessories that cost nearly as much for a small motor as for a large one. A source of direct current for field excitation is required, usually necessitating a d-c generator of some type. A more complicated starter is required than with an induction motor.

In larger sizes of motors, such as are usually employed for driving compressors installed in a central air system, however, synchronous motors are comparable or even lower in cost than induction motors. In addition, synchronous motors will invariably perform at a range of efficiency several points higher than the same size induction motor, giving further advantage to their use.

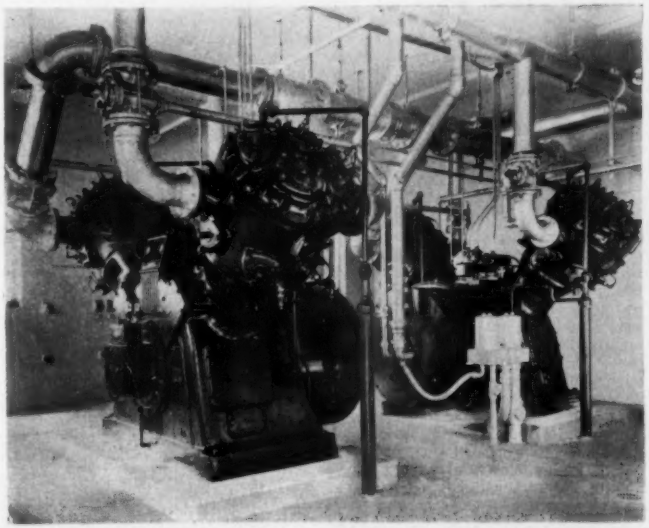
Maintaining correct operating pressure in the plant air system is very nearly as important for efficient plant operation as maintaining full rated voltage in the plant electrical system. If pneumatic tools perform essential tasks, pressure drop causes them to become sluggish, with output suffering. The units of production per manhour are certain to fall with inadequate air pressure. Irregular air pressure will frequently interfere with uniformity of product. Consequently, compressor control must assure uniform pressure in the system if production efficiency in the plant is to be maintained.

The central air system lends itself to the maintenance of uniform pressure because highly refined types of compressor controls are conventional with larger compressors. Such controls normally regulate the output of the compressor in a series of steps of partial load but with negligible variation in pressure.

As an example, a 100 hp, a 500 hp or a 1000 hp compressor fitted with 5-step control, will maintain discharge air pressure at 100 psig with a variation of only 3 or 4 psi between full load and no load. This is because one control mechanism, like a field army general, directs the unloading and reloading of the compressor. Where two or several compressors are installed at one location, it is common practice to integrate their controls for balancing their capacity against air demand with minimum pressure variation.

Unit System Control

Contrasted with this, the unit system customarily lacks any coordinated control, each compressor having its own field general to direct its own load conditions without regard to what's going on elsewhere. To be sure, each compressor installation may be set manually to unload at a different pressure. About as close a differential between unloading pressures as could be possible would be 4 to 5 psi. If six different compressors are employed, then the difference between the lowest and the highest settings may be as much as 24 to 30 psig, just in the unloading or cut-out pressure. Few plants can maintain effective



This photograph illustrates a compressor installation which might be typical of one used in any central system. These are two-stage, double-acting, water-cooled units of the "Y" type. This type is commonly built in sizes through 250 hp

UNIT SYSTEMS

job only, and then must be dismantled and rebuilt to be used on any other job. On the other hand, the unit system can be compared to the modern portable scaffolding that assembles and disassembles in a matter of seconds.

Selection of the proper size of compressor to use in unit systems is much easier than the proper selection of an over-all compressor that is going to take care of the needs of the plant during the life of the compressor. If the plant operation is starting out on a small scale, small compressors may be purchased and installed where required. As a plant grows, additional compressors may be installed when and where they are required. On the other hand, the same small plant starting out with a large central compressor system must try to foresee all of its compressed air requirements for the future, and must attempt to purchase a compressor of sufficient capacity to take care of its needs, or must allow room for replacement of the central compressor as the plant expands. Then if plant operation recedes, for example, after a war-time emergency, the compressor capacity is too great and nothing can be done without shutting down or eliminating a portion of the compressor capacity. With the unit system, compressors may be prepared for storage and set aside, or may even be sold.

To sum up: the advantages of the unit compressed air system far outweigh any advantages of a straight central system. Any plant contemplating a compressor installation should give serious thought to the proper application of the unit system, because it saves money in initial cost, erection cost, operation and maintenance, and is much more flexible when tying-in with changes in production needs.

Give the Authors a Hand

The authors of this two-section "debate" article worked long and hard in preparing the material which appears here. In addition to the actual work of gathering the material, writing it, and selecting illustrations, considerable correspondence between the authors, and the authors and the editors, was necessary; the authors also conferred in person. They have received no payment for the work other than the satisfaction of knowing they did a good job. If you agree, why not drop them a line; or write us and we'll pass the word along. Thanks.—The Editors.

CENTRAL SYSTEMS

and efficient operation of their air consuming equipment with such wide pressure variations.

If the controls of the numerous compressors in the unit system are set fairly close together, a narrower range of operating pressures will result. However, a situation may develop where several motors will start almost simultaneously, throwing a heavy burden on the plant electrical system. In addition, the close setting of the controls in the unit system is likely to cause pronounced "hunting" rather than the smooth, uniform unloading and reloading of a co-ordinated regulation. At best, the over-all range between lowest cut-in and highest cut out pressures of the unit system will be several times greater than that of the central system. This wide pressure variation usually works against production efficiency.

Wiring vs. Piping

The argument may be advanced that the unit system permits use of smaller air pipe because air is fed into an inter-connected system at the numerous points where compressors are located; where a unit system would require only 2 in. pipe, a central system would require 4 in. pipe. This cannot be denied. However, consider these additional expenses that accompany the 2 in. line of the unit system which are eliminated with the 4 in. line of the central system:

1. Running electrical wiring connections to motors located throughout the plant.
2. Wiring of the numerous motors and starters of the unit system.
3. Running cooling water pipe lines to the numerous compressors located at various points in the plant; and running additional water lines from compressors to drain. (Even if air-cooled compressors were used in the unit system, water is still required for aftercooling in most plants.)

The piping and wiring of the unit system are expensive luxuries.

Minor Advantages

Several other minor benefits favor the central system over those that have been enumerated.

It is obviously easier to inspect and maintain compressors and their accessories when they are all concentrated in one central location. While compressors, motors and motor starters are generally dependable equipment, they nevertheless do require regular inspection, occasional adjustment and periodic lubrication service. Air receivers should be drained of condensate at regular intervals. Such maintenance is certain to be more expensive in manhours with many compressors installed throughout the plant than with one or two compressors located in one place.

Generally speaking, the larger the compressor, the more refinements one finds built into it. Automatic shutdown devices, to stop the compressor because of high oil temperature, high discharge temperature, failure of cooling water supply, may easily be applied to a few large compressors but would be extremely expensive for many small ones.

Because the central air system assures the compressor of lowest initial cost, lowest operating cost, additional savings by the use of synchronous motors, most efficient and effective compressor control and

(Continued on page 140)

Table I. Comparison of power costs for compressing 2750 cfm air to 100 psig

Characteristics	Central System	Unit System
Volume of free air required at 100 psig	2750 cfm	2750 cfm
Number of compressors	1 or 2	5 or more
Bhp required to compress each 100 cfm[1]	18.2	22
Total hp required by compressors	500	605
Motor efficiency, per cent	93.15[2]	89.5[3]
Electrical hp input to motor	537	676
Kw input to motor	401	504
Power cost per hour at 1.2¢ kwh	$4.81	$6.05
Power cost per 10 hour day	$48.10	$60.50
Power cost per 300 day year	$13,430	$18,150
Annual savings of central system	**$3,720**	

[1] Conventional compressor performance.
[2] Mean efficiency between 93.7 per cent for 500 hp motor and 92.6 per cent for 250 hp motor, both slow speed synchronous type.
[3] Mean efficiency between 90 per cent for 100 hp motor and 89 per cent for 50 hp motor, both 1750 rpm induction type.

They Went Down 25 Ft— And Saved Two Weeks' Time

It was either a case of "Off with the roof!" or down through the floor, to install this 200,000 lb press . . . So, they drilled the holes for the tie-bolts 25 ft down through the floor, erected a gallows, and—read below how Texas Engineering & Manufacturing Co., Inc., completed the installation . . . They saved the roof and two weeks' time

WHAT STARTED OUT as the simple installation of another piece of equipment ended up as a major engineering feat when Texas Engineering and Manufacturing Company, Inc., Dallas, Texas, recently received a 1,000 ton Danly mechanical double action forming press under its Navy facility contract.

The problem was how to get the giant press, which weighed over two hundred thousand pounds and stood over 30 ft high, into an area with an overhead clearance of a little over 33 ft, from the floor and do it without disturbing production, 8 ft away.

Normally, when one of these presses is installed, the three sections are assembled one on top of the other with cranes, and four tie-bolts 25 ft long and 6 in. in diameter are dropped in from the top to clamp them together.

Following this procedure in this particular installation would, however, have meant removing a large section of the roof which not only would have been an extremely costly undertaking, but also would have meant exposing adjacent factory areas to inclement weather and loss of heat for the duration of the installation operation.

Convinced there must be an easier way, the company turned the problem over to its industrial engineering department and with typical Texas ingenuity, they came up with a procedure which combined oil field practices with those of the construction trade.

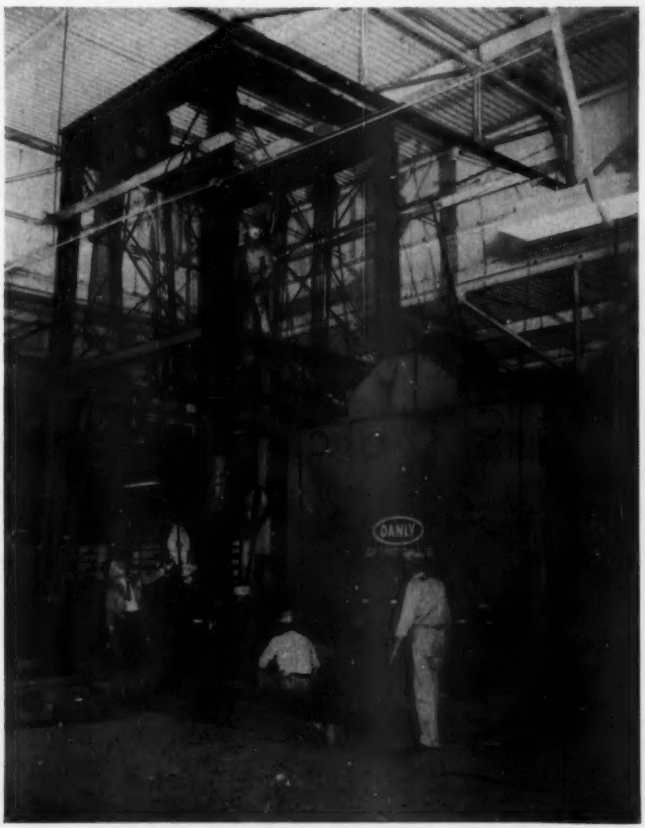
Unable to go up without raising the roof, the engineers reversed their field and went down. Four foundation pier holes 25 ft deep were bored into the ground, and after attaching eye-bolts to the upper ends of the 25 ft tie-bolts, the tie-bolts were lowered into these holes. Then the bottom section of the press was placed on the foundation.

Step number two was the erection of a gallows 33 ft high and built out of 14-in. steel H-columns. Then, using the lower section of the press as a base, the top section of the press, which in itself weighs 60 tons, was slid into place over the bottom section and then raised inside the gallows frame by jacking, cribbing and hoisting.

After the top section had been raised 11 ft., the center section was slid into place between the top and base section. Then cables were attached to the eye-bolts in the ends of the tie-bolts, and the tie-bolts were threaded up through the press to clamp the three sections together.

The method used not only avoided cutting the roof, but in addition saved two weeks erection time and permitted production to continue within eight feet of the press throughout the operation.

As Chief Industrial Engineer W. A. Tweedie put it, "the only way the operation could have been more successful would have been for us to strike oil while we were drilling the pier holes."



Sixty-ton top section of the 1,000 ton double-action mechanical forming press is slid into place in TEMCO plant in preparation for raising it in the gallows

Good Controls Mean Better Product At Timken

Close control of temperatures and speeds is necessary in many industrial applications today . . . Representative of industries which need such controls is Timken's steel mill at Gambrinus, Ohio, where fine steels are annealed, tempered and otherwise processed for use in many exacting applications including jet engines and gas turbines . . . Temperature, speed and time are the three major controllable factors which are governed by pneumatic, hydraulic and electrical controls

By ROBERT R. ELSASSER, Asst. Superintendent, Gambrinus Tube Mills
WM. R. BRIGHT, Foreman, Pyrometer Dept., Gambrinus Tube Mills
The Timken Roller Bearing Co., Canton, Ohio

THE TIMKEN Roller Bearing Company has long enjoyed a reputation for highest quality tapered roller bearings, rock-bits, alloy steel bars and seamless steel tubing. To maintain this quality, a great many control instruments are in every day use in all of the plants producing these several products. Due to the scope of an article trying to cover all these phases, consideration will be limited to a small segment of the manufacturing facilities of The Timken Roller Bearing Company. For this purpose, some of the control instruments used in the Gambrinus plant of the Steel and Tube Division of The Timken Roller Bearing Company will be reviewed.

The Gambrinus Plant includes a tube mill, forge shop, annealing and heat treating, pickling, cold drawing, wire drawing, straightening, cutting, inspection, and other finishing operations, as well as a number of auxiliary operations.

It is evident that all variables in any operation, such as time, speed, feed, temperature, pressure, power input, and others can be controlled and must be controlled either manually or automatically with proper instrumentation.

Temperature Control

One of the oldest and most useful of automatic controls is that of furnace temperature control. Obviously, in the hot working and annealing of high quality alloy bars, seamless tubing and forgings, temperature control is of paramount importance and, therefore, this control is of largest use in this plant. A review of a few such applications should begin with the heating of billets for the piercing mill.

The billet heating furnace is shaped like a large doughnut with a rotary hearth and has its charging and discharging doors close together at one side of the outside edge. Accurate discharge temperatures and adequate soaking time are necessary to insure good piercing in a wide variety of analysis and sizes. To insure this, the furnace is divided into five zones, each zone being controlled by either an indicating or recording controller equipped with a pneumatic control. No 1 zone is the charging zone. This zone with No. 2 and 3 zones indicate and control the temperature by means of platinum rhodium thermocouples. No. 4 and 5 zones (No. 5 being the discharge zone) are equipped with instruments which indicate, record, and control temperature by means of an optical system. Here, temperature is measured by the radiation from a ceramic tube projecting into the furnace.

All five zone controllers, by means of the pneumatic control, regulate the air pressure in the headers supplying the burners. This in turn operates a hydraulic control system which proportions the gas to the gas headers supplying each zone. The hydraulic controllers consist of two diaphragms, one actuated by header air pressure, and the other by the resulting gas pressure. One works against the other, and this operation positions the hydraulic part of the unit to strike a balance between the two pressures to hold the furnace at the set temperature of the controller.

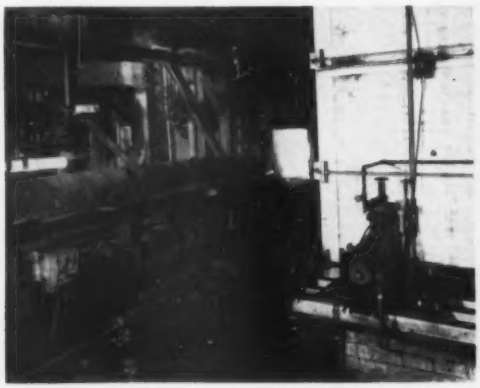


Fig. 1. Rotary hearth furnace used to heat billets for piercing mill; discharge is at far left, charging is at center. Stack damper control is visible at the far right in photograph

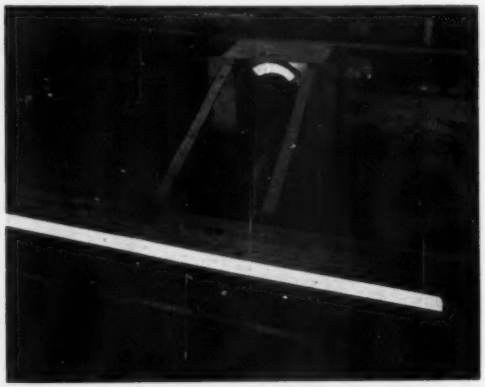


Fig. 2. Optical instrument for measuring temperature of seamless steel tubing. This temperature measurement takes place as the tubes move past the instrument on conveyor

A similar hydraulic control unit is used to automatically regulate the dampers on the furnace stacks to maintain positive pressure within the furnace chamber. See Fig. 1. All of these control systems together assure proper temperature control and efficient combustion with resultant low fuel cost.

Since the size of a finished hot rolled tube is quite dependent upon the shrinkage from the hot sizing, and since the shrinkage is dependent upon the temperature at finish of the hot sizing operation, the reheat furnace prior to hot sizing (or sinking) must be accurately controlled. This furnace is equipped with a circular chart indicating recorder, together with an electric proportioning control unit. The temperature is measured by an optical type instrument sighted on a closed end ceramic tube projecting into the furnace. As a check on finishing temperatures, the tubes leaving the sizing or sinking mill pass in front of another optical instrument which indicates and records but does not control the temperature of the tube passing in front of the lenses.

This instrument consists of an operating head, power unit, recording instrument, and an indicating instrument. The operating head is mounted on springs to reduce vibration and placed so that it can be sighted directly on the work. See Fig. 2. Contained within the operating head is a system of lenses and a measuring system. The optical lenses are so arranged that the rays of light from the hot tube fall directly on the measuring system, which produces a small voltage. This voltage is amplified and the resulting current is then indicated and recorded. The indicator instrument is mounted on top of the operating head. The recording instrument is placed in another location so that temperature can be checked at two different locations at the same time and a permanent record made available.

In the annealing department, material receives one or more of the following treatments: annealing, normalizing, quenching or tempering. This work is done in several different types of furnaces including controlled atmosphere, car types, roller hearths, or a high temperature pusher-type quench furnace equipped with water and oil quench tanks. Controlled atmosphere furnaces are used for cycle annealing of high carbon bearing tubing, high carbon wire, and tool steels, where decarburization and scale must be prevented. See Fig. 3.

These furnaces are made up of a stationary base on which the charge, in a suitable rack, is placed and an inner cover placed over the charge. Over this is placed a heating cover equipped with the necessary burners and valves to heat and control the furnace. Control must be accurate

Fig. 3. General view of controlled atmosphere furnaces used for cycle annealing tool steels, high carbon tubing, wire without resulting scale or decarburization

in order to insure correct annealing cycles so that the desired structure of the steel is always obtained. Each heating cover is divided into three zones, each zone controlled by an indicating controller and electric proportioning control units. The three controlling instruments are connected to thermocouples; one in each zone of the heating cover. The controllers are all mounted on a panel with a three point indicating recording instrument. This panel is connected to thermocouples placed directly on the steel in the charge.

This will indicate and record actual steel temperature from three different places in the charge. The panel is also equipped with timers calibrated in hours and minutes, and with rate interrupters calibrated in degrees per hour. All equipment on the panels is so connected that the charge is heated to a predetermined temperature, soaked there for a timed period, fast cooled at a predetermined rate, and then slow cooled at a predetermined rate until the charge is down to discharging temperature. The instrument panel, shown in Fig. 4, is designed to operate according to this cycle automatically after instruments, timers, and rate interrupters have been set and the furnace lighted.

Fig. 4. Control panel for controlled atmosphere furnaces shown in Fig. 3.

Atmosphere gas, which is circulated around and through the charge constantly during the operation, is produced in four gas plants. Each plant is controlled by an instrument equipped with electric proportioning control. This keeps the gas plants at correct temperature for producing proper atmosphere gas and, thereby, protects the charge from decarburization and scale.

The three roller hearth furnaces are long tunnel type units with driven rolls placed crosswise on which the charge is propelled through the furnace. The work passes through the furnace on the driven rolls and can be held at one temperature, or heated in part of the zones and cooled in successive zones. These furnaces are used for normalizing, tempering, annealing between cold draw passes, and finish annealing. Accurate temperature control is necessary to insure quality of product.

One furnace has five zones, another has six zones, and the third has seven zones. Each individual zone is controlled by an indicating recorder controller equipped with electric proportioning control. The thermocouples for each zone are mounted in the roof and so arranged that they can be raised or lowered for different sizes of work. The controlling instruments electrically operate butterfly valves in the air headers. The resulting air pressures then operate hydraulic controls which position the gas valves to maintain set temperatures in each zone.

In addition to the controlling

Fig. 5. Heat treating furnace which can be used either for oil or water quenching of seamless tubing or alloy bar stock

Fig. 6. Control panel for the pusher-type, gas-fired heat treating furnace shown in the preceding illustration, Fig. 5

instruments each furnace has an indicating recording strip chart instrument whose actuating elements consist of an optical instrument mounted in the discharge zone of each furnace showing actual temperature of the charge. This enables the operator to be sure that the charge is at the correct temperature before discharge. In addition, the seven zone furnace has a similar installation in the third zone for special heating cycles. Here the steel can be heated in the first three zones to a determined temperature and cooled in the other four.

Heat-Treating Furnace

This optical instrument indicates whether steel is at the correct temperature before starting to cool. The high temperature gas-fired pusher-type furnace is used for steel tubes and bars requiring high temperature and either oil or water quenching. See Figs. 5 and 6. This furnace consists of three zones; the two end zones being controlled by indicating controllers, the center by a strip chart indicating recording controller, and all three zones being equipped with proportioning controls. It is rectangular in shape and work is charged at one side and pushed through it to the discharge side by means of push rods.

Three thermocouples are mounted through the roof directly over the discharge rolls and adjusted above the work so that control temperature is also the work temperature. Quenching is automatically timed and the material is then brought out of the quenching tank by endless chain lifts into racks. From there it is placed into a pit furnace equipped with an indicating on and off controller which holds the furnace at low set temperature. A four point instrument indicates and records the temperature throughout the length of steel. This operation is used to relieve the strain caused by the quenching operation. The steel will stay in this furnace until material is ready to be tempered.

Car-type furnaces, as their name implies, are long, narrow furnaces with the bottom of the furnace mounted on wheels and tracks so that it can be moved out of the furnace for charging and discharging work. These furnaces are used for cycle annealing of alloy bars and seamless tubes. Temperature control is important to insure that the proper cycle is obtained. There are seven car-type furnaces divided into four zones, each zone being controlled by an indicating controller and electric proportioning control unit.

In addition to the control thermocouples, each of the four zones, plus the front bottom, and back bottom are equipped with additional thermocouples. These six couples are connected to a six-point indicating recorder, and except for the two bottom couples, are placed on top of the charge and spaced equally in the furnace so that the temperature is indicated and recorded throughout the length of the charge. The car type furnaces are equipped with constant air input burners maintaining a positive pressure in furnaces at all temperatures. Temperature control is achieved by regulating the input gas to the burners by means of a porportioning control which operates adjustable port proportioning valves in the gas lines leading to each zone.

Forging operations include a 1000 ton press and a 3000 ton press. To insure quality, temperatures must be accurately controlled, since high alloy and stainless materials are primary products of these operations.

The first 1000 ton press has a battery of five furnaces, shown in Fig. 7, to heat ingots and blooms for processing into squares and various shapes. These furnaces are all equipped with either strip chart or circular chart indicating recording controllers and electric proportioning control units. Temperature is measured by means of optical instruments sighted on closed end ceramic tubes which are installed in the roof of each furnace. All furnaces in the department are checked periodically by means of a portable optical pyrometer, sighting directly on the charge as a further check on the actual steel temperature. This is done so that steel is properly heated according to metallurgical department specifications as to rate of heating, soaking time, and top temperature.

The 3000 ton press is primarily used for pressing 16-25-6 stainless steel. This steel is ultimately used in jet engines, gas turbines, and turbo-superchargers. This press has five high temperature box-type furnaces, and one preheat car type furnace. The car type furnace is equipped with one recording indicating controller and an electronic proportioning control unit.

Incidentally, this electronic control unit promises much, since maintenance cost is low, repairs easy to make, and speed of response to changes in temperature is high. The car furnace is equipped with constant air pressure burners and is used to preheat ingots at a timed rate after which the ingots are then transferred into the box furnaces for heating to forging temperature. The box furnaces are large rectangular furnaces, each equipped with an indicating recording controller and electric proportioning control unit. The temperature is measured by means of optical units sighted on ceramic tubes in the roof of the furnace.

Speed Control

In addition to temperatures, speed is also an item which can be automatically controlled. One example of this is the speed control of the roller hearth furnace, previously considered under temperature control. While the actual control is manual, it is important that accurate indicating and recording be made of the speed of rotation of the rollers,

Fig. 7. Two of the furnaces used to heat steel ingots, blooms, billets for 1000 ton press. Note control instrument at right

Fig. 8. Recording instrument and tachometer on roller hearth furnace. This instrument indicates, records speed of product

and therefore, of the movement of the work. To accomplish this, the rollers are driven by continuous variable speed drive units, whose speed is indicated and recorded by an electric tachometer, shown in Fig. 8, connected to a small d-c generator, which is mechanically coupled to the variable speed unit. This aids accurate manual setting of roller speeds.

Time Control

Time also is controlled in many operations. One was mentioned in the section dealing with the quenching furnace. Still another example is the timing used on induction heating of stainless tubes for upsetting. Here temperature must be held closely. The rate of heating is high and the time element, being the only easily controllable variable, must be very accurately controlled. The heating equipment for this operation consists of a motor generator set with a generator frequency of 3000 cycles. Generator output is connected along with necessary capacitors to a water cooled induction coil designed for the size tube being heated. The power to the coil is controlled by a timer calibrated in minutes and seconds so that setting of the timer basically controls the temperature of material being heated. When a tube is inserted in the heating coil the timer is set for a predetermined time and the push button is pressed. A green light mounted above the push button lights up, indicating the tube is being heated. At the end of the timed period, the timer shuts off the power to the coil and lights a red light mounted beside the green light. The tube is then removed from the coil and placed in the upsetting machine and processed. The entire heating operation, therefore, is controlled by the timer.

Another variable to which instrumentation and control can be applied is that of acidity and alkalinity, or as it is usually expressed, pH value. Instrumentation, shown in Fig. 9, has been utilized to measure the pH value of neutralized waste pickle liquor at The Timken Roller Bearing Company. This is of interest due to the national efforts made to reduce stream and ground water pollution. In this particular case the control is manual, but the continuous indicating and recording gives more accurate manual control and provides a permanent record of acidity or akalinity of the discharge from the neutralizing plant.

Waste pickle liquor is neutralized by lime and the alkalinity is increased to precipitate dissolved iron salts. This is accomplished in a batch agitated tank. The lime is reacted with the waste pickle liquor until the alkalinity is correct and the liquor is discharged.

Alkalinity or acidity (or pH value) is measured by a unit whose elements are acted upon to produce a voltage proportional to the pH of the liquid being measured. This voltage is indicated and recorded as pH value by a suitable instrument. As a result of the continuous recording of pH value, the operator knows precisely when to dump the batch, with assurance that the discharge is sufficiently alkaline and at the same time that lime is not wasted through overrunning the desired pH value.

Another control is one used to increase efficiency of wire pickling. This control is essentially a temperature controller, controlling a solenoid two way valve. When the pickling bath temperature is low, steam is injected into the bath. As soon as temperature reaches the control point, the steam is shut off automatically and an air valve is opened and compressed air introduced into the bath, resulting in better pickling due to constant agitation by either steam or air, and accurate temperature control.

In this plant, as is true in many plants, stand-by gaseous fuel must be provided when industrial use of natural gas is curtailed in severe cold weather. Propane is used as a stand-by fuel. So that changeover from natural gas to propane is done with a minimum of change in combustion equipment, it is desirable to maintain the same Btu value in both fuels. To obtain the same value, air is blended with the propane gas, and is automatically proportioned by means of a hydraulic control. As a check device on the Btu of the blend an optical instrument is used. This instrument measures flame intensity on a light sensitive cell. The effect on the light sensitive cell operates a control which automatically shuts off the entire blending operation when Btu value varies excessively from the desired value.

While quality of product and efficiency of operations is of prime importance, safety of personnel and equipment cannot be overlooked. On much of our combustion equipment, safety controls are an integral part of the installation. Specifically,

(Continued on page 139)

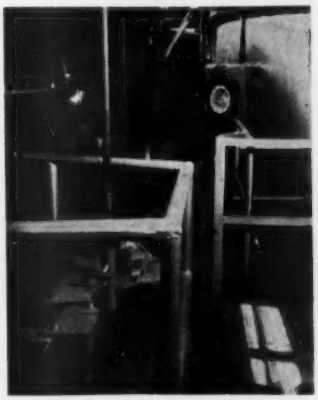


Fig. 9. Instrument used for indicating and recording pH at neutralizing plant

Plant Engineers of the Calumet Region Form New Group

Twenty-two plant engineers from industries in Greater Chicago's largest industrial area, the Calumet Region, comprising East Chicago, Hammond, Indiana Harbor and Gary, hold initial meeting . . . Former members of Central Chicago Plant Engineer's Club make initial move to intensify membership and concentrate groups into geographical areas

Prospective Members—Note!

Plant engineers and others with similar job responsibilities who are interested in joining the Plant Engineers of the Calumet Region may get complete details by contacting Edgar Hanford, Plant Engineer, Lever Brothers, Hammond, Ind.; Maurice O'Hern, Works Engineer, American Steel Foundry, (the Hammond plant) East Chicago, Ind.; or Otto Siedl, Asst. Plant Engineer, Combustion Engineering-Superheater, Incorporated, East Chicago, Indiana

WHEN THE Chicago Plant Engineers' Club was formed, March 9, 1951, its plans called for the eventual formation of other clubs in the major industrial areas surrounding Greater Chicago. The first of such units has now come into being. On January 8, twenty-two plant engineers met at Phil Schmidt's Restaurant in Hammond for the inaugural dinner meeting.

The name of the new group, which was chosen by unanimous vote, is "Plant Engineers of the Calumet Region." This area, one of the most vital industrial sections in the nation, promises to produce one of the most dynamic of the several plant engineering organizations now in existence.

Officers elected at the initial meeting were: Edgar Hanford, Lever Brothers, President; Maurice O'Hern, American Steel Foundry, Vice-president; and Otto Seidl, Combustion Engineering-Superheater, Inc., Secretary-Treasurer. Clifford Leisure, Grasselli Chemicals Dept., E. I. du Pont, was appointed a committee of one to draft a constitution for the group and present it at the next meeting. Program committee appointment was held in abeyance until the second meeting.

Subsequent meetings are to be held on the 3rd Tuesday of each month and will be preceded by a dinner at Phil Schmidt's Restaurant in Hammond.

Plant Engineers of the Calumet Region in attendance at the group's first meeting, held at Phil Schmidt's Restaurant, Hammond, Ind., were, left to right, standing: Clifford Leisure, Works Engineer, Grasselli Chemicals Dept., E. I. du Pont; Maurice O'Hern, Works Engineer, American Steel Foundry (Hammond plant); C. D'Arcy, Plant Engineer, Calumet Steel Castings Co.; Arthur Terry, Plant Engineer, Keyes Fiber Co.; C. L. Jung, Chief Engineer, Swift & Co.; Paul Frey, Plant Engineer and Purchasing Agent, U. S. Reduction Co.; Donald Abraham, Plant and Process Engineer, Screw Conveyor Corp.; Harold Harmon, Engineer, American Steel Foundry; Herbert E. Carlson, Asst. Plant Engineer, Cities Service; Frank Bodenschatz, Works Engineer, American Steel Foundry (Indiana Harbor plant); John Lyon, Asst. Works Engineer, American Steel Foundry; Alvin Schuler, Plant Engineer, USS Lead Refinery; and Walter Gruca, Works Engineer, Standard Forgings Corp. Seated, left to right: John McKenna, Plant Engineer, Eagle-Picher Co.; Earl Phares, Superintendent, Taylor Chain Co.; R. A. Coleman, Engineer, Federated Metals Div.; R. E. Roehrick, Asst. Plant Engineer, Combustion Engineering-Superheater, Inc.; Otto Seidl, Asst. Plant Engineer, Combustion Engineering-Superheater, Inc.; Thomas E. Hanson, Managing Editor, Plant Engineering; William Graham, Plant Engineer, American Maize Products; Harry Gahagan, Plant Engineer, General American Aerocoach Co.; Frank Stentz, Chief Engineer, LaSalle Steel Co.; and Edgar Hanford, Plant Engineer, Lever Brothers. Subsequent meetings of this group will be held on the 3rd Tuesday of each month

Design Plant Utility Tunnels With an Eye to Flexibility

Consider these items when planning the design of an industrial tunnel . . . Utilities to be housed . . . Physical dimensions of all services . . . Practical arrangement of utilities . . . Size of tunnel or duct . . . Other important factors which should be considered include location, ventilation, waterproofing, drains, sumps, inserts and manholes

By R. M. **FRANCIS**

SOME TYPE of underfloor or underground tunnel is used in industrial plants for housing pipes and electrical utilities. Such tunnels serve as communication ducts, between buildings, for all sorts of traffic, as well. There is nothing new in these statements, but it is a case of "out of sight, out of mind." We rarely stop to think of things we do not see, and which aren't bothering us. Tunnels are like that; either they don't bother us at all, or they give us a lot of headaches.

Industrial Tunnels

Why have industrial tunnels? First, to get pipes and cables out of the way. Second, to save running those pipes and cables overhead or across streets. Third, to provide easy access to these utilities for maintenance; which is not possible if the items are buried. To get the fullest use out of an industrial tunnel, certain factors concerning its flexibility should be considered.

Tunnel design is fairly well standardized; concrete construction, reinforced and waterproofed, is the accepted pattern. But, except for sizes, shapes, and materials used, there are many features of tunnel design which are not standardized. Every tunnel is custom-built to properly serve a given location and set of conditions.

What utilities should go into a tunnel? The academic answer is: every utility which can be sensibly placed there. Years ago, it was considered good practice to put steam mains, steam returns, and electric cables in tunnels. Then, telephone cables were added. Similarly, along came water and drain lines, pneumatic tubes, air lines, and even conveyors. And why not? Certainly, it makes sense to utilize a common duct for all utilities which can be safely, and economically, housed together. The basic cost of any tunnel is not influenced too greatly by what equipment goes inside, therefore, full use should be made of its cross-sectional area.

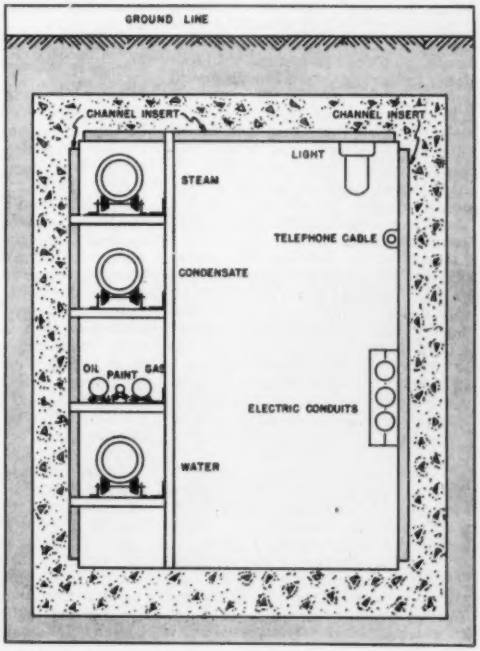
Determining the location of the required tunnels will necessitate considerable study. But do not accept the first obvious answer that comes along. There is a definite pattern for each plant, which can be determined only after consideration of all possible uses to which the tunnels can be put.

Utilities to be Housed

After locations are fixed, start the design studies by first selecting the utilities to be housed. List the definite items first; such as steam lines, condensate returns, electric cables, etc. Then, consider all other services which *could* be included; not necessarily which *should* be. Then weigh the hazard, the practicability, and the economics, of housing them in a common duct. The right answers will begin to appear.

The particular type of industry you are engaged in will dictate some of the answers. For instance, if you do a lot of spray-painting, and have a central mixing room, you may wish to put the paint lines in a convenient tunnel. Or, if it's a food-processing industry, soup might well flow underground, in a glass pipeline. After considering all possibilities, you will be in a position to determine exactly what should be placed in the tunnel, and the design will start to crystallize.

Placement of the services inside the tunnel is of utmost importance. Just remember that all those pipes and cables aren't going to behave forever; pipes will leak or break; cables will fail, and have to be spliced; in fact, lots of things can happen over the life of the tunnel.



Square channel insert offers greater flexibility in placement of utilities. The services should be so placed as to provide the best maintenance working space

Thought, therefore, should be given to the maintenance men who will have to service the utilities. And think of future expansion. Don't get "boxed-in" for lack of an extra foot or two of space.

Drainage

Assuming that the pipes will leak or break—the same as all others do—provisions should be made for necessary drainage in the tunnels. In all underground structures, this calls for pitched floors and sump pumps. Incidentally, don't be too stingy in sizing the pump; pick a size that will handle a line break and not just a little seepage water. Flooded tunnels result in expensive maintenance work.

One design feature of importance is electrical wiring. This should be extensive and complete. Good lighting, with proper switching, is absolutely essential. Receptacles should be provided at regular intervals to furnish power for test and maintenance equipment. If the job is to be 100 per cent complete, a telephone circuit, with plug-in jacks for use with a portable telephone hand-set, should be installed. Also, install necessary alarm circuits, to warn of troubles from the various services.

Some form of ventilation is usually required for most tunnels to relieve condensation, remove excess heat, and to provide comfortable working conditions for personnel.

Tunnel entrances, or manholes, do not have to be booby-traps. If properly designed, they can be as utilitarian as above ground building details. Good ladders should be permanently installed, light switches should be placed in convenient locations, and safety guard fences should pull up as the covers are removed.

In the layout design, do not overlook the fact that long lengths of pipe might have to be taken into the tunnel at some future date. If sharp turns prevent taking a long length of pipe to all parts of the tunnel, provide more than one "long" opening.

If one of the services is a water line, provide frequent taps for use by maintenance men. They cost so little, and mean so much when needed. Also, consider the installation of tees and valves at certain intervals for continuity of service.

Pipes expand and contract in tunnels, just the same as they do elsewhere; so, expansion joints are a "must." Drain fittings should be provided at low points in lines.

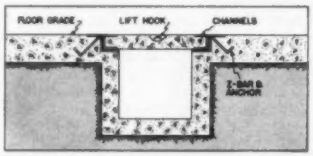
Finally consider painting the tunnels as this will be an incentive toward good housekeeping. Be sure to identify all ducts with a clean, legible, standard marker system.

One-story plants, or the ground floor of multi-story buildings, can generally use a system of floor-trenches to very good advantage. Floor trenches differ from tunnels principally in size and type of construction. Naturally, the number and sizes of services are limited in a trench.

In the layout of floor trenches, a regular grid pattern should be established. Investigation of the plant's requirements will probably establish the need for lateral runs in each bay with longitudinal runs at least on outside edges and in the middle of the floor and more, if required. The main purpose of such a grid pattern is to give flexibility to the plant. With proper spacing, it is a relatively quick and inexpensive job to connect new equipment to required services in any part of the plant.

Selection of services to be placed in the trenches is easy, when the requirements of production equipment is known. Such utilities as steam, condensate, water, and air are excellent candidates; while drain pipes, gas lines, cutting oil systems, are also considered. Simply list the various utilities required in your operations and explore each one in turn. Electrical wiring is usually kept out of trenches, although there is no reason why it can't go there if the demand is great enough.

In the design of the trench and the covers, care must be used in



The covers of a floor trench should be in rigid, removable sections and strong enough to withstand heavy plant traffic

selecting a style which is practical and workable. The covers should be in rigid, removable sections, strong enough to withstand the traffic of materials handling equipment. These sections should fit fairly close and should be flush with the floor. Depressed lift-rings should be built into the sections, for easy removal. Light channel-iron frames give the required dimensional accuracy, while reinforced concrete slabs, poured into the channel frames, give a suitable load-bearing floor section.

To keep the trenches clean, the joint between cover and trench can be poured full of a suitable compound to seal the crack. This compound should be of a material that can be easily removed when necessary.

Certain manufacturing operations require ducts wherein a large volume of liquid must be returned to a sump, for pumping back to a given point. In such cases, the floor trench can be used for both incoming and outgoing services.

Steam for heating, and water for cooling, can be carried in the same trench. The water and steam pipes should be placed above the water line flowing in the trench. The main purpose of such an arrangement is to permit flash steam to be exhausted into the water of the trench, at atmospheric pressure. If this design is indicated, the trenches must be sloped to a sump, where the open-flume water can be effectively carried away.

Pipe Galleys

Pipe galleys, of course, are no different from tunnels, except, that they are usually in an accessible part of a basement, mezzanine, or upper floor. In vertical shafts, there is an anchoring problem not common to a horizontal shaft or galley. All vertical pipes, conduits and bus-bars must be securely anchored at intervals to support their weight. Horizontal galleys usually provide housing for the several utilities required in a plant, when there is justification for so grouping them.

In the design of any form of utility duct, do not just fit the pipes in any old way. It is one thing to install the pipes originally; however, it is something entirely different to remove those pipes, or even to do maintenance work on them. Test the design by assuming that you have to remove each section of piping in reverse order to the installation. Can it be done sensibly? And economically? And quickly? If not, change the design to something more practical.

Control Water in Concrete Mix

VERY FEW users of concrete realize how important it is to properly control the water content to produce good strength concrete, according to H. J. Kaiser Co. Form and flat work in which wet concrete is used invariably develops shrinkage cracking. Also, wet concrete walls and slabs are never leak proof.

Furthermore, wet concrete segregates readily in job handling resulting in honeycomb or rock pockets. This condition is most likely to occur in thin-section reinforced wall construction. Since sloppy concrete easily segregates as it falls, larger particles gather in isolated areas within the form.

It is possible to produce concrete having a strength (at 28 days) of as low as 1,000 psi or as high as 5,000 psi with the same batch weights of cement, sand and rock by changing the amount of water used. A happy medium exists between the wet and dry extremes where there is ample water to produce a plastic workable mixture that can be placed with a minimum of effort.

Too often the lesson is learned the hard way on a "specification" job. A month after a pour is in place the 28-day test indicates that the strength is below specification.

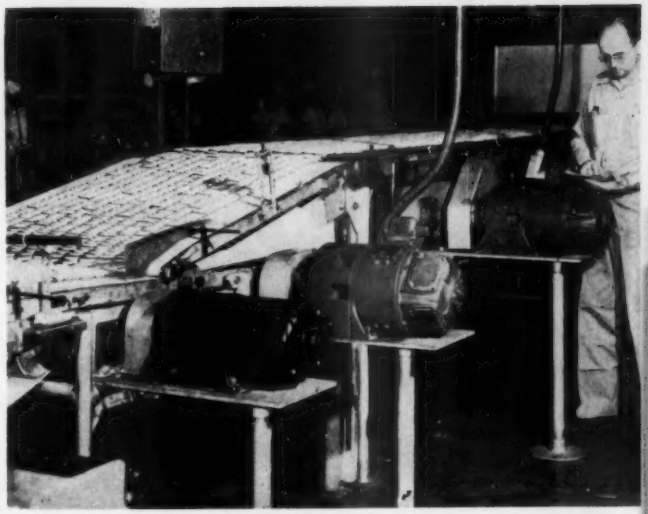
VARIABLE SPEED DRIVES
Help Industry Produce, Maintain Quality

VARIABLE SPEED drives are widely used in industry to adjust the speed on plant machines and to provide the exact speed needed under varying operating conditions.

Such speed changes are important since a creeping speed may be required prior to the actual operation for adjustments or for positioning of tools and workpieces.

In addition, variable speed drives help maintain the quality of the product and control the production flow through different groups of machines through the various departments and processes throughout the entire plant.

A few examples of the many uses of these drives are shown in the following pictures. These show how the variable speed drives are used for adjusting the speed of feed rolls on a printing press, sychronizing operations in making inner tubes, controlling operations on a cigarette machine, calibrating speeds on fuel pump injection tests, maintaining coordination and making adjustments on bakery production line, controlling speeds of semi-automatic plating conveyor, varying the impregnation for the different paper thicknesses, and for automatic welding of equipment, to mention a few.

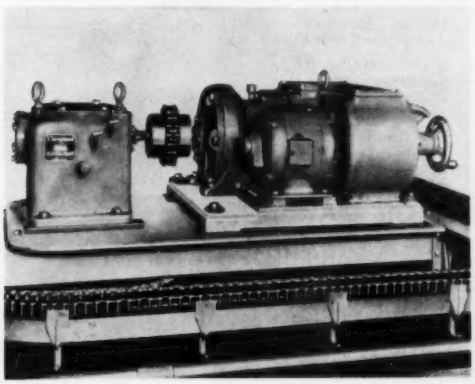


COORDINATED DRIVE ON PRODUCTION LINE

Some of the 26 General Electric Thymo-trol units that provide coordinated drive on this 600 ft long baked goods production line at Keebler Weyl Baking Co. This line makes a number of baked products which are formed with cutting machine, baked in a continuous band oven, stacked on cooling conveyors and packaged at delivery end. The motors are controlled by electronic equipment which enables the company to maintain coordination on production line

CONTROLLED SPEED FOR PLATING

This Vari-Speed Motodrive controls the speed of this semi-automatic plating conveyor. This Reeves drive is directly connected to a flexible chain coupling to a worm gear reducer with a perpendicular, downward extended shaft. The operator is able to obtain a 4:1 variation in the speed of the conveyor, the exact speed being dependent upon the type of metal being plated and the thickness of plating desired



CONSTANT TENSION MAINTAINED

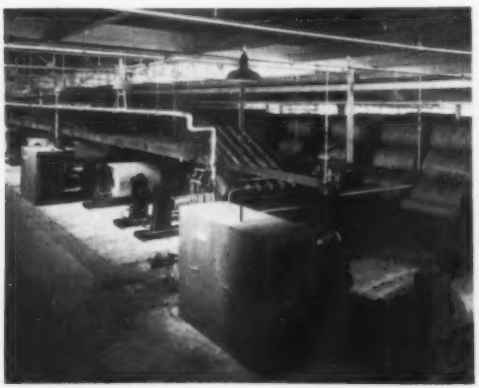
A variable speed transmission, of Reeves Pulley Co., with hydraulic automatic control, is used to drive the feed roll on this printing press. The hydraulic automatic control is connected to a dancer roll in such a manner as to speed up or slow down the feed rolls in order to maintain a constant tension on the paper. This installation prints, cuts and creases carton blanks and delivers them automatically stripped

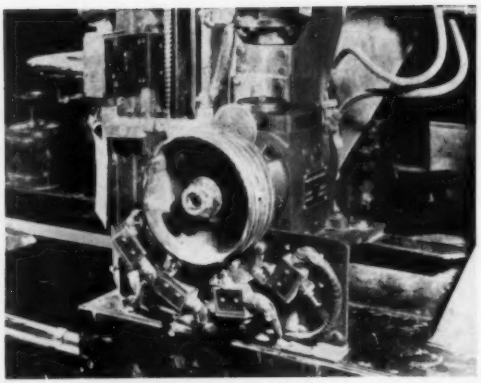
EXACT SPEEDS REQUIRED

This General Electric Type ACA motor provides the many different exact speeds required by the milling machine at Judson Steel Corp. plant, Oakland, Calif. The machine mills deformations on rolls used in a corrugating machine for processing concrete reinforcing bars. The deformations in the grooves vary in depth and number depending upon the size and type of bar to be rolled. This adjustable speed motor reduced time required to prepare rolls for process

VARIETY OF SPEEDS NECESSARY

This combined corrugator assembly uses large cabinets, or spot conversion units, made by Reliance Electric and Engineering Co., to adjust the speeds of this paper converting machinery. The fundamental reasons for variable speed drives are to secure maximum efficiency of production, to provide versatility for handling different products and, in the instance of the combined corrugator, to synchronize the variety of speeds required of different parts of the machine



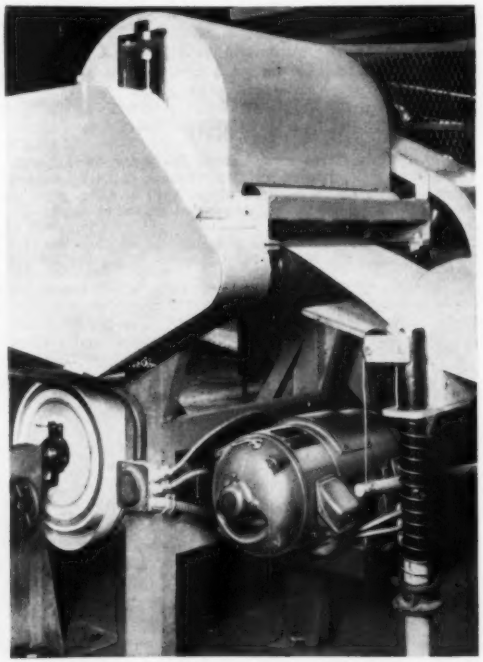


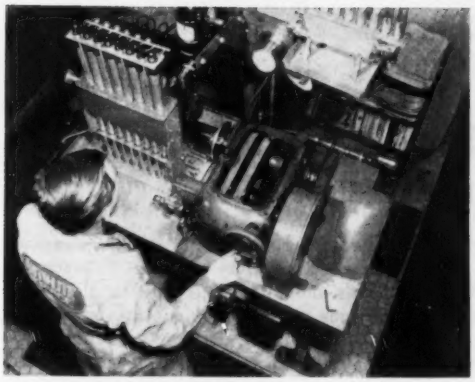
SYNCHRONIZED SPEEDS ESSENTIAL

The Graham Model 45 E variable speed transmission is used in making Goodyear truck tubes. Part of the job is to control and rigidly maintain the length of the tube within a tolerance that demands an unvarying accuracy within .04 of 1 per cent in the delivered speed. The name and size are stamped on inner tube, hole punched, valve applied and stock cut to length—all operations must be perfectly synchronized as timing must be accurate and rigidly maintained

ADJUSTMENTS FOR THICKNESS IMPORTANT

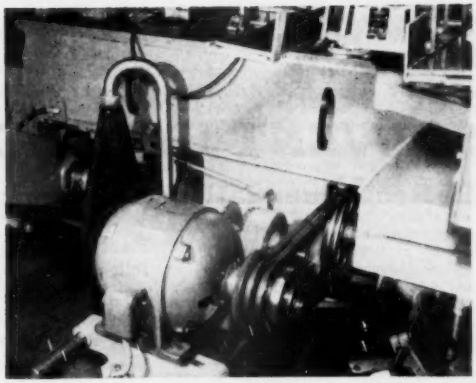
This cornice machine is used in processing fairly heavy paper material, as in the manufacture of washable window shades. Variable speed control is desirable from the standpoint of weight of material being processed. That is, the rate of impregnation is definite for a given thickness and must be varied for the different thicknesses which are impregnated. This is possible with an Ajusto-Spede, made by Louis Allis Co., which adjusts speeds for various thicknesses





UNIFORM SPEEDS UNDER TEST VIBRATION

The American Bosch Corp., Springfield, Mass., has installed Allis-Chalmers Vari-Pitch speed changers on its fuel pump injection test stands where diesel motor fuel pumps and governors are tested. The speed changers provide a simple and accurate means of calibrating at speeds of from 600 to 900 rpm. They also help maintain uniform high speeds under test vibrations, which condition exists in service when heavy fuel pumps are tested under high pressure up to 2500 psi

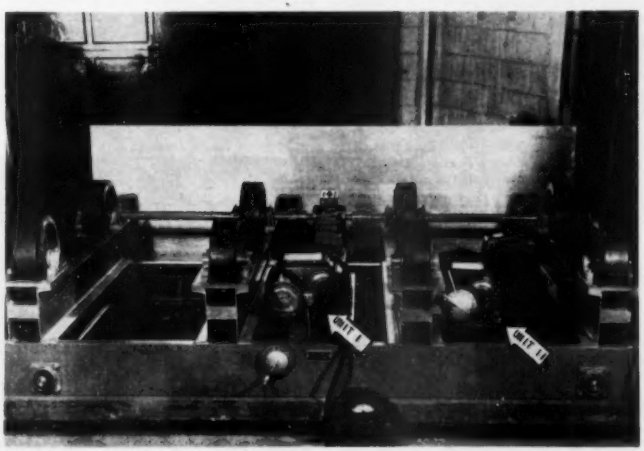


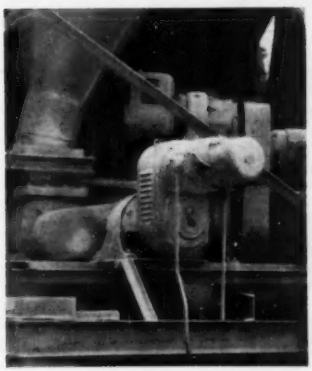
SPEED VARIATIONS MAINTAINED

The American Tobacco Co. found that the drives of certain machines at its Louisville, Kentucky, plant did not maintain constant speeds due to varying conditions. These speed variations were compensated for either by frequent changing of the motor sheaves, which cut into production, or by step sheaves which would not permit intermediate speeds. Allis-Chalmers Vari-Pitch sheaves were installed so that any desired, stepless, speed adjustments could be easily made

VARIABLE SPEED DRIVES PROVIDE DESIRED SPEEDS FOR WELDING OPERATIONS

This automatic welding machine is equipped with two U. S. Varidrive motors. Unit I is ¾ hp with output speeds of 155 to 21 rpm; unit II provides 1½ hp with output speeds of 3220 to 500 rpm. The machine is used at Lummus Co., Honesdale, Pa., for automatic welding of longitudinal seams and circumferential welds on heat exchangers and oil refinery tanks. Designed to support and rotate vessels weighing as much as 20 tons, this machine provides for welding speeds from 5-40 in. per min. Right angle remote controls bring the speed controlling handwheels of the drives within easy reach of the operator so that the speeds can be instantaneously changed for the desired welding speed or size of material handled



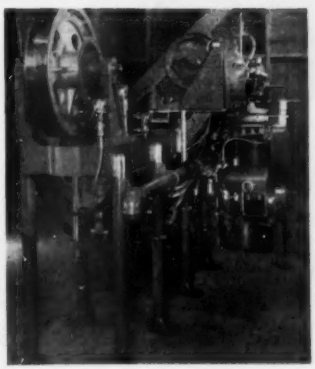


POWERS CONVEYOR EQUIPMENT

Left: These two combination U. S. Varidrive-Synchrogears are used to power conveyor equipment for feed screws, grinders, sackers and other power requirements of Oil Base, Inc.

CONTROLS TUBE WELDING

Right: This 5 case Varidrive-Synchrogear of U. S. Electrical Motors, Inc., drives a specially designed flying loop welding machine which is used in the production of thin wall tubing for the Rome Cable Corp. With this variable drive, the exact heat time relation can be obtained for a required thickness and welding surface. This is accomplished by varying tube speed through machine as well as varying the welding



SOLVENT HAZARDS INVESTIGATED

II-Recommendations for Workable Safety Program*

Plant safety program was not reaching all workers . . . So, company follows three steps in setting up effective safety program . . . It secures complete information on solvents and compounds used in plant . . . Provides safeguards for hazardous solvents and educates employees regarding hazards of material handled . . . And, only workers with excellent safety records are chosen to work with hazardous substances

By CARL O. KNELL, Process Engineer

AFTER SEVERAL minor mishaps resulted from improper handling of organic solvents and petroleum compounds, a midwestern plant became convinced that its safety program was not working in a satisfactory manner. Through the medium of a thorough survey it was determined that these subtances, while potentially hazardous, were not considered so by the worker. From this standpoint, the general plant safety program was not reaching a vital segment of the working force.

Because of this, a specialized safety effort was devised and directed toward these men. This effort, as detailed in the following sections, has proven itself through a significant decrease in the accident rate among employees.

Prior to instituting a safety program regarding the handling, use, storage, and consumption of petroleum compounds or organic solvents, the employer must first decide the degree of hazard involved. He must distinguish between those that are highly volatile and those that are not. He must know which are highly flammable, and which, in normal usage, present no particular hazard. There is the problem of toxicity, either from vapor, from the liquid itself, or from both.

When this information is accumulated, and the safety procedures determined, it must then be transmitted in an effective manner to a receptive employee.

Compiling Information

Most suppliers will provide, upon request, pertinent data regarding the substances they supply. Other data can be found in handbooks, state and federal manuals, association publications, and from public and private health agencies. A listing of information for use in formulating the program might consist of the following: 1. Name of material; 2. Flash point; 3. Degree of toxicity; 4. Monthly consumption; 5. How purchased (drum, carboy, etc.); 6. How stored; 7. Where stored; 8. Handling procedure; 9. Dispensing procedure; 10. Quantity ordered at one time; 11. Maximum amount kept on hand; and 12. Special safety techniques or protective equipment.

In reference to the preceding, some plants may consider additional information to be necessary; others, with fewer substances to catalog, may regard some as superfluous. In any circumstance, adequate data must be obtained so that the employer will be able, from the standpoint of the safety program, to isolate and spotlight the hazardous items.

When these data are gathered, it will be a relatively simple matter to ascertain those items which require special care in either the storing, handling, or consumption phase. It is, therefore, necessary for the consumer to determine, for his own plant, and within his own state, local,

Photo: Ethyl Corp.

Any safety operation should be worked out strictly according to each individual set of circumstances. The job of cleaning out this large gasoline storage tank safely calls for airline hosemasks, rubber boots, gloves, harnesses and lifelines

* The first part of this article appeared in the January 1952 issue of PLANT ENGINEERING, page 83.

hygienic, and insurance regulations, the necessary procedures to be followed for each individual item. The procedures or precautions necessary for safe conditions will not be mentioned here due to their scope and variety, only the method of effectively introducing and maintaining them.

Educating Employees

Far more difficult than accumulating the necessary information is the problem of transmitting it to the employee in such a manner that he will recognize its importance, accept the restrictions it entails, and, by his own actions, influence his co-workers. It is generally recognized that it is not the lack of safety regulations, nor the lack of information available to the employee that is behind a great many industrial accidents, but the fact that the employee is not convinced that safety regulations exist more for his benefit than for the benefit of the company.

This is particularly true in the case of petroleum compounds and organic solvents, since it is difficult to convince a person that substances similar to the gasoline he may use for a spot remover can be so hazardous that it can cause him serious injury or death.

The first step in the education procedure is up to management. It must lay the groundwork by making the working conditions as safe as possible. This does not mean only to consider the legal aspects of the use of the material, but over and above that, to provide the additional safeguards that make the difference between a safe place to work, and a *good* safe place to work. When an employee likes his employer, and, furthermore, can see visual evidence that the employer considers the worker's interest, the regulations enacted by management will be more readily accepted.

Such items as accessible smoking areas, if smoking is permitted in the plant, generally will discourage sneaking smokes in a forbidden area. Accessible wash basins, and/or safety showers, if the material is toxic, will help. Flameproof treated coveralls are an effective safety stimulus, although their efficacy is doubtful. In short, the first step is an overstep by management.

The second step is to familiarize the employee with the type of material he is handling, and then educate him visually, orally, and through literature with any hazards involved. This might be termed the scare procedure, since its purpose is to effectively impress on the employee's mind the fact that carelessness or incautious actions can introduce a hazard that is otherwise not present.

In this same category is the teaching of the proper methods of using the compounds or solvents. This should never be entrusted by supervision to another employee. As much as possible, the same person should instruct each employee in his job. This person should be either the man's foreman, another member of supervision who has been instructed in training techniques, or a safety engineer. Where a person without proper training attempts to instruct another, his method at best, no matter how well he knows his job, will be haphazard. Over a period of time errors of omission or commission will accrue, to the detriment of the whole program.

Select Safe Worker

This is an important factor that is often overlooked, for on this hinges a great deal of the success and effectiveness of a safety program. A receptive worker, one who will accept safety restrictions, is a safe worker.

Only persons who have been working in the plant long enough so that their personal qualities are well known should be chosen to work with organic solvents and petroleum compounds. No matter how intelligent or able a person is, if he is without a sense of responsibility, or has a reckless manner of attacking an assignment on a potentially hazardous undertaking, he is a threat, not only to himself, but to his co-workers and management as well.

Personal habits should not be overlooked. A history of alcoholism should be enough to disqualify a person. The skin of a person with a history of industrial dermatitis will be more sensitive to irritation from solvents and their vapors. Those with acne are liable to have it aggravated. A history of respiratory disease, high susceptibility to coughs and colds, or hyperthyroidism should also disqualify a person. Competent medical opinion in the evaluation of these conditions and of the personnel involved should be considered.

Summing up, when the three factors of information, education, and worker selection are combined, a vigorous and effective program can be evolved. With this program subject to repeated emphasis by the safety department, it will pay dividends in the form of a lower accident rate. It will instill all concerned with a safety attitude, and mean more careful handling of the material involved.

Designer Dreams Up Contraptions For Fluorescent Lamps

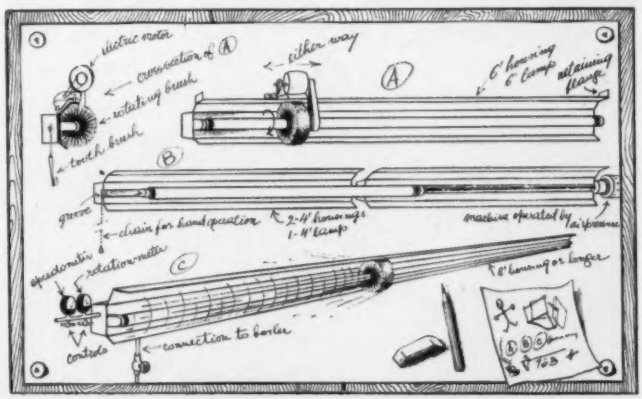
One of the "pseudo-designers" at Smithcraft Lighting Division came up with these "ideas" to add to the company's imposing record of "firsts."

Item A on the drawing board shows the rotating brush which travels slowly back and forth along the fixture, flicking away particles of dust even as they fall. The result: no cleaning problem at any time. A retaining flange prevents the brush from falling off the lamp, and, in addition, snaps a switch on the brush assembly to change its direction of travel. A toothbrush is included as an accessory, should some fastidious person ever want to clean flange. (But, don't order it.)

Item B shows how the 4 ft lamp, powered by air pressure, moves back and forth along an 8 ft reflector. If it moves fast enough, you get the effect of an 8 ft lamp and, naturally, 8 linear feet of lighting.

Item C is the designer's pride and joy. The rotating brush stops for just a fraction of a second every two inches. The result is that the viewer gets the impression that a "louver" has been formed and, ergo, shielding of the lamp is accomplished!

Our pseudo-designer, in disclosing these "ideas," started his presentation with "You may think I'm crazy, but . . . " No comment.

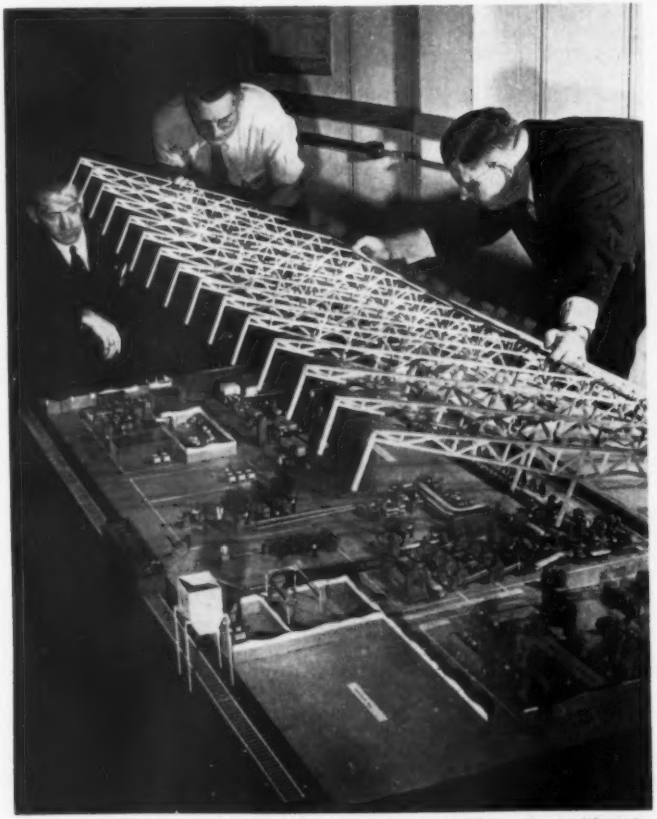


Selling Plant Layouts to Management—Part II. Cost Analysis

In submitting plant layouts to management, says the author, descriptive summary of capital outlay needed for the project, the production costs involved, and the resulting net profit must be included in support of the project in order for it to gain due consideration . . . Typical example of proposed project is examined and tables show how project may be subdivided so that any or all of portions of project can be accepted or rejected by management without killing the entire job

By A. T. GAUDREAU, Manager, Gaudreau, Rimbach & Associates

ACCOMPANYING the visual aids, plant layout drawings, and supporting flow diagrams, and forming perhaps the most imporant part of the presentation, is the evaluation of the proposal in terms of cash outlays and returns on investment. Accounting complications become the death knell of many a layout project, however sound it may have been from the standpoint of practical manufacturing operations.



Having completed his three-dimensional layout of a single-story plant with scale models of machinery, equipment, conveyors, railroad sidings, the layout engineer climaxes his visual presentation by superimposing a skeleton framework of roof-truss structure with supporting columns. For executives who have little patience or familiarity with drawings this type of layout presentation holds interest

Business decisions to purchase new industrial facilities, whether they are plant alterations, additions, or new construction, are influenced by a number of factors which are ultimately summed up in the level of earning power of these new facilities. While operating the existing plant, the manufacturing executive may see new plans and ideas coming across his desk every day. Unless these plans or ideas are expressed in terms of probable sales and profits involved they may be pigeonholed.

In submitting a plant layout proposal to management, a descriptive summary of the capital outlay needed for the project, the production cost involved, and the resulting net profit must be included in support of the project in order for it to gain due consideration before being shelved prematurely.

In the case of plans for expansion, however, the project does not always necessarily have to include profits in order to become thoroughly sound and attractive to management. Although the reduction of production costs stands high in the list of important reasons for new facilities, it is not always the sole criterion. Other decisive situations that at times compel management to contemplate new construction and equipment expenditures include such considerations as:

1. Essential expansion blocked by lack of space.

2. Obsolescence of existing buildings. This situation may require modernization of old buildings or construction of new ones to enable the enterprise to remain on a competitive level.

3. Loss of effectiveness of machinery and equipment caused by limitations imposed on the plant layouts by the buildings housing these layouts.

4. Need of decentralizing operations into smaller units to establish better control, higher efficiency, and greater flexibility for expansion.

5. Need for changing the location of the plant to be closer to sales

markets or sources of raw materials; or for better transportation facilities; or to secure better employee facilities, such as housing, transportation, and recreation.

Each reason for plant alteration or expansion should be thus developed clearly and in detail to warrant management interest.

Financial Factors

In developing the layout project down to this point, consideration has been given to production requirements, existing buildings and facilities, and the plant layout design for the project. There still remains a fourth and final source of information to be explored, namely, that of cost and financial factors. In most projects, whether large or small, this is the body of factors which management uses as the main criterion for arriving at its decision on a layout project.

This group of crucial factors falls into the following two main categories:

Cost information in the form of statements, records and ledgers obtained from the accounting department for the purpose of evaluating the layout proposal in terms of financial returns to the company.

Financial factors in selecting one of several proposals. These factors relate particularly to the capital outlay required for the project, and to the net profit expected to result from it.

Production Costs

An illustration of how the plant layout engineer arrives at his estimates of production costs to result from a project is given in Table I.

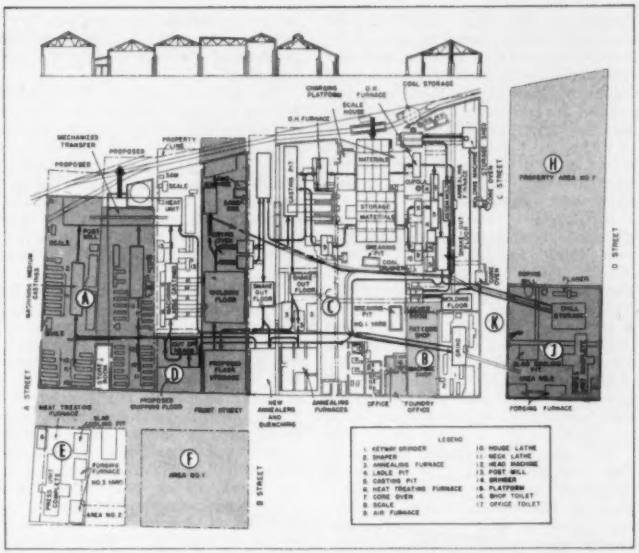


Fig. 1. Modernization layout of foundry and machine shop. On this plan the flow of materials has been rearranged to reflect the results of eight separate construction projects, identified by shaded areas lettered from A to K and corresponding to the lettered layout projects described and evaluated in Table V

The particular cost account estimated in this illustration is that of direct labor. The table shows the amount of additional direct labor cost which will be incurred to produce the increase of 8,500 tons projected in the proposed layout.

It so happens that this particular case example calls for an outright increase in capacity, hence the presentation in terms of "added cost." Had the project called merely for modernization of existing production activities, the cost estimate would most likely have been expressed in terms of "savings."

In either event, the cost estimate is arrived at from two independent but co-ordinating angles, namely:

a. Flat additional costs incurred by increased tonnage. This group covers estimates of outright in-

Table I. Estimate of added cost for increased production

Cost Account: Direct labor — Plant departments: All productive and service

Investment plan No.: 9 — Construction projects Nos.: A, B, C, D, J, and K

Date: May 5, 1949

Existing property affected: Foundry and machine shop

Description of plan: Extend plant into area 7 and buy section of C Street

Plant Department	Actual Cost per Ton	Extra Heavy Castings	New Line of Forged Products	Total Added Cost
Increased tonnage involved		6,000	2,500	8,500
Flat additional costs incurred by increased tonnage				
Open-hearth furnaces		$ 4,000	$ 4,000	$ 8,000
Cleaning and chipping		6,000	2,000	8,000
Machine shop		25,000	——	25,000
Shipping labor		2,000	——	2,000
Maintenance labor		3,000	2,000	5,000
New forge shop		——	15,000	15,000
Total flat additional labor		$40,000	$23,000	$ 63,000
Departmental costs varying directly with increased tonnage				
Coremaking and molding	$6.94	$41,640	——	$ 41,640
Transportation (present foundry)	1.60	9,660	——	9,660
Machine shop	3.63	——	$ 9,050	9,050
Receiving, stores, and yard	1.07	——	2,675	2,675
Transportation (new forge shop)	2.96	——	7,400	7,400
Total directly variable labor		$51,300	$19,125	$ 70,425
GRAND TOTAL ADDED COST				
Grand total additional direct labor		$91,300	$42,125	$133,425

Table II. Tabulated statement of material, labor and expense

Investment plan No.: 9 — Construction projects Nos.: A, B, C, D, J, and K

Date: May 5, 1949

Existing property affected: Foundry and machine shop

Description of plan: Extend plant into area 7 and buy section of C Street

Description of Statement Item	Statement for Last Actual Year	Estimated Statement for New Plan	Returns on Expenditures Changes over Actual Year	Per Cent Change
Total production in tons cast	24,700	33,200	+ 8,500	+ 34
Production material	$1,042,780	$1,318,352	+$ 275,572	+ 26
Direct labor	$ 838,956	$ 972,381	+$ 133,425*	+ 16
Contributing labor	508,141	559,733	+ 51,592	+ 10
Supervision	187,793	187,793	——	——
Overtime premium	37,500	39,240	+ 1,740	+ 5
Clerical and maintenance labor	62,489	63,797	+ 1,308	+ 2
Vacations	55,431	61,637	+ 6,206	+ 11
Total labor	$1,690,310	$1,884,581	+$ 194,271	+ 11
Electric power	$ 48,590	$ 62,490	+$ 13,900	+ 29
Fuel	172,303	228,233	+ 55,930	+ 32
Chills and flasks, depreciation	52,084	72,084	+ 20,000	+ 38
Supplies, general	201,555	239,805	+ 38,250	+ 19
Repairs and maintenance supplies	108,004	135,944	+ 27,940	+ 26
Total power, fuel, and supplies	$ 582,536	$ 738,556	+$ 156,020	+ 27
Insurance, comp. and group	$ 36,154	$ 40,291	+$ 4,137	+ 12
Taxes, social security	42,972	47,861	+ 4,889	+ 11
Taxes, property	14,059	16,266	+ 2,207	+ 16
Miscell. expenses and income	—9,616	—9,616	——	——
Total general expense	$ 83,569	$ 94,802	+$ 11,233	+ 13
Total material, labor, expense	$3,399,195	$4,036,291	+$ 637,096	+ 19

* Method of estimating increase of $133,425 in direct labor is developed in Table I.

creases in personnel which must be made in certain operating and service departments to take care of the new facilities proposed for the added business. So long as these new facilities are placed in operation, they inevitably require a fixed number of attendants. This number is needed all at once and does not vary with volume, except when volume begins to exceed extreme limits.

b. Directly variable costs are those departmental costs (still direct labor in the illustration at hand) which vary directly with changes in production volume. These costs may be determined on a pro-rata basis per quantity unit, such as per ton of added volume. Directly variable costs may be estimated statistically from such bases as actual cost per unit, standard cost per unit, or standard time value per unit.

The effect of increased volume in this example is to give rise to a combined added cost of $133,425 a year in direct labor alone. But direct labor is only one of the accounts which make up total production cost. The corresponding effect in the other prime cost accounts becomes the basis of our next consideration as illustrated in Table II.

The account of direct labor will be recognized on the third line from the top of the table where it reflects the annual increase of $133,425 just described.

The determination of direct labor cost on a layout project is about as far as the plant layout engineer, or most engineers for that matter, gets in completing the proposal for presentation to management. This not only marks the engineer's turning point in the presentation but also the stage where sound and practical layout projects reach an untimely end.

Two principal reasons exist for this customary demise of the proposal. One is that plant layout engineers are normally not sufficiently familiar with accounting technique to develop the financial angles, such as total operating costs, sales returns, and deductions from gross profit, of a project so as to be able to point out its economic advantages. This function is usually placed in the hands of an accountant. The other reason is that this same accountant is seldom moved by inclination or training to wade through layout plans and support engineering data far enough to gain a practical insight of the basic merits of the project from an operation standpoint. This weakness in the presentation seems to lie more heavily on the side of the engineer than on that of the accountant, however.

Total Manufacturing Cost

Returning to Table II we find there a complete statement of manufacturing cost for the foundry and machine shop for which the layout project has been planned. Like most accounting statements, a comparison is made between the following two sets of costs for one year: Column 1. Statement for last actual year. Column 2. Estimated statement for new plan (that is, the last actual year modified to include the effects of the layout project.)

These two columns of figures are strictly within the accountant's domain, and therefore remain subject to his interpretation rather than to that of the engineer. Yet, the engineer can readily apply these two sets of cost figures himself with little or no interpretation from the accountant.

As an example, let us look again at the account of Direct Labor appearing on the third line from the top of Table II. To arrive at all the figures appearing in the four columns for this account, the engineer simply proceeds as follows:

Table III. Analysis of net profit for projected returns

Investment plan No.: 9 Construction projects Nos.: A, B, C, D, J, and K

Date: May 5, 1949

Existing property affected: Foundry and machine shop

Description of plan: Extend plant into area 7 and buy section of C Street

Description of Statement Item	Statement for Last Actual Year	Estimated Statement for New Plan	Returns on Expenditures Changes over Actual Year	Per Cent Change
Total production in tons cast	24,700	33,200	+ 8,500	+ 34
Gross sales	$4,344,800	$6,574,800	+$2,230,000	+ 51
Less: returns and allowances	$ 136,641	$ 326,001	+$ 189,360	+ 14
freight outbound	134,086	205,446	+ 71,360	+ 53
Net sales	$4,074,073	$6,043,353	+$1,969,280	+ 48
Material, labor, and manufacturing expense	$3,399,195*	$4,036,291*	+$ 637,096	+ 19
Less: decrease in work in process	73,699	73,699	——	——
Cost of sales	$3,325,496	$3,962,592	+$ 637,096	+ 19
Gross profit	$ 748,577	$2,080,761	+$1,332,184	
Selling expenses	$ 197,142	$ 197,142	——	——
Administrative expenses	96,883	96,883	——	——
Taxes not elsewhere charged	2,686	2,686	——	——
Provision for depreciation	106,145	141,711	+$ 35,566	+ 33
Other income	—16,208	—16,208	——	——
Miscellaneous deductions	1,319	1,319	——	——
Total deduct's from gross profit	$ 387,967	$ 423,533	+$ 35,566	——
Moving expenses, etc., in first year	——	$ 130,200	+$ 130,200	——
Net profit: amount	$ 360,610	$1,527,028	+$1,166,418	——
Net profit: per cent	8.9	25.3	+ 16.4	——

Analysis of increased sales resulting from this plan

Lines of Products	Net Tons	Price per Ton	Sales Value
Extra heavy castings	6,000	$205	$1,230,000
Forged products	2,500	400	1,000,000
Total added volume	8,500		$2,230,000

* Statement of material, labor, and expense by cost accounts appears in Table II.

Table IV. Five-year estimated returns on layout projects

Investment plan No.: 9 Construction projects Nos.: A, B, C, D, J, and K

Date: May 5, 1949

Existing property affected: Foundry and machine shop

Description of plan: Extend plant into area 7 and buy section of C Street

Description of Statement Item	Statement for Last Actual Year	Estimated Statement for New Plan	Returns on Expenditures Changes over Actual Year	Per Cent Change
New capital expenditure (fixed capital) for this plan			$1,349,145	
FIRST YEAR OF PLAN				
Net sales	$4,074,073	$6,043,353	+$1,969,280	+ 48
Less: cost of sales	$3,325,496	$3,962,592	+$ 637,096	+ 19
deductions from gross profit	387,967	423,533	+ 35,566	
moving expense, etc., first year	——	130,200	+ 130,200	
Net profit: amount	$ 360,610	$1,527,028*	+$1,166,418*	
Net profit: per cent	8.9	25.3	+ 16.4	
SECOND YEAR OF PLAN				
Net sales	$4,074,073	$7,053,233	+$2,979,160	+ 73
Less: cost of sales	$3,325,496	$4,128,375	+$ 802,879	+ 24
deductions from gross profit	387,967	427,533	+ 39,566	
Net profit: amount	$ 360,610	$2,497,325	+$2,136,715	
Net profit: per cent	8.9	35.4	+ 26.5	
THIRD YEAR OF PLAN				
Net sales	$4,074,073	$8,063,113	+$3,989,040	+ 98
Less: cost of sales	$3,325,496	$4,294,182	+$ 968,686	+ 29
deductions from gross profit	387,967	431,533	+ 43,566	
Net profit: amount	$ 360,610	$3,337,398	+$2,976,788	
Net profit: per cent	8.9	41.4	+ 32.5	
FOURTH YEAR OF PLAN				
Net sales	$4,074,073	$8,663,993	+$4,589,920	+112
Less: cost of sales	$3,325,496	$4,459,991	+$1,134,495	+ 34
deductions from gross profit	387,967	435,533	+ 47,566	
Net profit: amount	$ 360,610	$3,768,469	+$3,407,859	
Net profit: per cent	9.9	43.5	+ 34.6	
FIFTH YEAR OF PLAN				
Net sales	$4,074,073	$8,855,873	+$4,781,800	+117
Less: cost of sales	$3,325,496	$4,534,161	+$1,208,665	+ 36
deductions from gross profit	387,967	439,533	+ 51,566	
Net profit: amount	$ 360,610	$3,882,179	+$3,521,569	
Net profit: per cent	8.9	43.8	+ 34.9	

* First year projected returns are further analyzed in Table III.

Kaylo Insulating Roof Tile is gaining rapid acceptance for all types of buildings because it provides a strong, durable roof deck that is both *incombustible* and *insulating* – yet lightweight. This remarkable structural material, a hydrous calcium silicate, offers economy of steel in the supporting structure and greater live-load-carrying capacity in relation to the dead weight of the deck. Moreover, the lightweight Kaylo Tile is easy to handle and place—speeds up work and saves erection costs.

For complete details on Kaylo Insulating Roof Tile, write Dept. N-298, Owens-Illinois Glass Company, Kaylo Division, Toledo 1, Ohio.

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...*pioneered by* OWENS-ILLINOIS **Glass Company**

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Table V. Summary of ten different optional investment plans for modernizing typical foundry and machine shop

Construction Project	DESCRIPTION OF LAYOUT PROJECTS	PLAN 1 Minimum Expenditures for Inevitable Rehabilitation	PLAN 2 To Remove Overload from Present Large Castings	PLAN 3 To Increase Output of Line of Extra Heavy Castings	PLAN 4 To Add Forge Shop on Plot Between A Street and Alley	PLAN 5 To Increase Large Castings and Add New Line at A Street	PLAN 6 To Extend Plant across Front Street Between A and B Streets	PLAN 7 To Add Forge Shop on Corner Plot Between C and D Streets	PLAN 8 To Increase Large Castings and Add Forge Shop at C Street	PLAN 9 To Extend Plant into Area 7, and Buy Section of C Street	PLAN 10 To Build Entirely New Plant in a More Advantageous Location
A	New foundry at A Street	$398,460	$398,460	$ 398,460	$ 398,460	$ 398,460	$ 398,460	$ 398,460	$ 398,460	$ 398,460	
B	New Service building near C Street	127,175	127,175	127,175	127,175	127,175	127,175	127,175	127,175	127,175	
C	Additional 100-ton crane for heavy castings		205,100	205,100	205,100	205,100	205,100	205,100	205,100	205,100	
D	Converting 3 buildings between A and B Streets			328,360		328,360	328,360		328,360	328,360	
E	New forge shop at A Street (instead of J)				411,850	411,850	411,850				
F	Expansion area through Front Street						150,000				
J	New forge shop at C Street (instead of E)							405,250	405,250	405,250	
K	Expansion area by closing C Street									15,000	
Z	Build whole new plant in a different location										
	(a) Sell existing land, buildings, and immobile equipment, and write off unrealized net book value.										$ 937,891
	(b) Acquire land in new location, construct new buildings, and replace immobile equipment abandoned.										3,245,000
	(c) Loss of selling and administrative expense and of net profit for 2 months while moving to new plant location.										130,927
	Total cost of projects under each plan	$525,635	$730,735	$1,059,095	$1,142,585	$1,470,945	$1,620,945	$1,135,985	$1,464,345	$1,479,345	$4,313,818
	BREAKDOWN OF INVESTMENT BY TYPES OF OUTLAYS										
	Capital expenditure, land buildings and equipment	$461,235	$662,335	$ 928,895	$ 18,000	$ 18,000	$ 143,000	$ 32,000	$ 32,000	$ 47,000†	$ 265,000
	Moving expense chargeable to manufacturing cost	64,400	68,400	130,200	1,056,185	1,322,745	1,347,745	1,035,585	1,302,145	1,302,145†	2,805,000
	Loss in net book value chargeable to reserve for depreciation				68,400	130,200	130,200	68,400	130,200	130,200	175,000
	Loss of gross profit for 2 months while moving										937,891
	Total cost of projects under each plan	$525,635	$730,735	$1,059,095	$1,142,585	$1,470,945	$1,620,945	$1,135,985	$1,464,345	$1,479,345	$4,313,818

† Five-year projected returns on capital expenditures for Plan 9 are summarized in Table IV.

1. The figure $838,956 in the first column is a matter of readily-accessible record on the plant's manufacturing statement for the last twelve-month period. So he simply transcribes that column of figures from an issued statement.

2. The figure of $133,425 in the third column originates with the engineer in the first place as was seen in Table I.

3. The figure of $972,381 in column 2 is simply the result obtained by combining columns 1 and 3. But this is precisely where the accountant and the engineer differ in their approach to the same end. The accountant is prone to develop the figure of $972,381 in the second column by completely dissecting the figure of $838,956 in the first column and reassembling these detached elements to arrive at the figure of $972,381 in the second. In cost accounts where allocations are involved, the engineer may get woefully lost in the accountant's reasoning and calculations. To overcome this handicap and at the same time come up with as sound an answer, the engineer need only calculate directly the "changes over actual" in column 3. By so doing, he will be limiting his cost calculations to absolute additions or reductions in cost, and thereby arrive at the ultimate objective directly without wading through cost allocations and at times inadvertently costing his project out of further consideration.

The statement in Table II shows that an increase of 8,500 in total tons cast (see top line) will increase total material, labor and manufacturing expense (on bottom line) by $637,-096. Our next step is to examine the effect of this added tonnage and corresponding production cost on the company's net profit.

Effect on Net Profit

For the purpose of estimating the net profit to be derived from the first year of operations with the new layout project, let us refer to Table III. On the sixth line of figures from the top, the item of material, labor, and manufacturing expense showing a projected increase of $637,096 will be recognized as the total result obtained from Table II.

In the analysis in Table III, we find that the physical output in tons cast is increased by 34 per cent by the layout project, but that gross sales returns have jumped 51 per cent. This spread is due to higher sales prices obtainable for two new lines of products introduced by the new layout, as summarized at the foot of the table. The sales price factor, therefore, has a direct influence on the justification of the layout proposal, and the plant engineer should keep this in mind in developing his presentation.

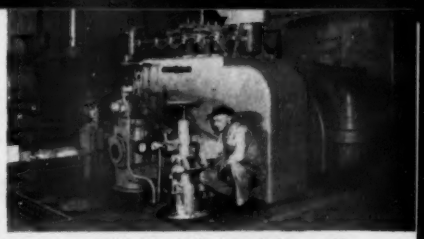
The percentage of annual net profit for the company, as shown near the bottom of the statement, jumps from an existing margin of 8.9 per cent to a proposed margin of 25.3 per cent yielding a net profit figure of $1,527,028 for the first year of operations under the new layout.

An analysis of the net profit returns obtainable during the first five years under the proposed plan is made in Table IV, in the second column to the right. This column points out that the new plan will yield an annual percentage of net profit which progresses upward over the first four years, namely from 25.3 to 43.5 per cent, and then levels off to 43.8 per cent in the fifth year. In this connection, it is important to note that estimates of net profit should not stop with an examination of only the first year of operations. It may be, as in this case, that the returns in subsequent years far exceed the initial showing to be made in the first year.

In terms of actual money, the plan will, in its fifth year, bring in $3,-521,569 more net profit per year than would be secured with the existing layout. During the first year alone the projected increase in net profit amounts to $1,166,418 involving, of course, a capital outlay to achieve this result. This outlay, as we shall see presently, amounts to

(Continued on page 132)

Johns-Manville's effective maintenance program includes an adequate maintenance budget, providing for trained maintenance men, modern tools and test instruments. At the Building Products Division plant in Manville, N. J., job priorities are assigned at weekly meetings of maintenance supervisors.



Equipment condition is checked regularly, as with this 5000-kw G-E turbine-generator. G-E Equipment Re-Conditioning Survey Forms help this operation.

Sufficient stocks of renewal parts are kept, and replenished when necessary. G-E Renewal-Parts Survey Forms make this process easier and faster.

An equipment-record system guides workers in planning inspection, cleaning, etc. G-E Motor Record Cards are a useful part of this system.

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Approved maintenance practices prevail in the plant's motor-repair shop, with the help of G-E "how-to" booklets on maintaining electric equipment.

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Selling management on the importance of maintenance is a top-priority job for maintenance superintendents today. Now—with its new Productive Maintenance program—General Electric offers a helping hand.

At Johns-Manville, where management has long been sold on the value of maintenance, several factors are included in their effective maintenance program. Most important are planned equipment overhauls to minimize breakdowns. Result: greater production—from each machine, from available manpower, from smoother work flow.

Ask your G-E Apparatus Service Shop representative to help you start a Productive Maintenance program—now!

New G-E "Kit of Tools" helps win added support for your maintenance job

Now, with the "tools" contained in this helpful kit for maintenance men, you can show your management the production-boosting advantages of a Productive Maintenance program for your own plant. Write for your free kit to *General Electric Company, Section 801-5, Schenectady 5, N. Y.*

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NEW PRODUCTS

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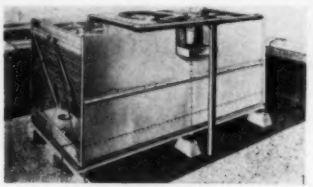
SPEED REDUCERS — The Type DB speed reducer is particularly designed to satisfy conditions in which coupled motor and gear drive is desired along with compactness and saving in space. The mechanical parts (gearing, housing, etc.) of company's Type C and E gearmotors have been adapted to speed reducer construction by substitution of a bracket with necessary additional pinion shaft and bearings for the normally "built-in" used in gearmotor construction.

Eight sizes of units are available, providing gear ratios from 6:25 to 58.3 to 1, and ratings from approximately ½ to 150 hp, depending on gear ratio and motor speed required. Standardized fabricated steel bedplates to support motor and gear unit, as well as necessary flexible couplings, are available for each size. *Westinghouse Electric Corp., Box 2099, Pittsburgh, Pa.*

WATER COOLING TOWER—A new concept in water cooling for use wherever intermediate capacities of cold water are required is the Double-Flow Aquatower. It is designed to combine the high efficiency of manufacturer's double-flow design wtih the compact simplicity of the Aquatower. An outstanding feature of the new tower is



its low height (only 7½ ft for the 150-t unit); it detracts little from the appearance of a building. Weight is evenly distributed over a wider area than usual for cooling towers of similar capacity.

The Double Flow Aquatower is available in all steel or wood with asbestos cement board casing, and comes in seven sizes starting with a 50-t unit. Towers in this range are widely used in power, petroleum, gas, chemical and food processing and metalworking industries, and wherever air conditioning and refrigeration are used. An 8-pp brochure will be furnished on request. *The Marley Co., Inc., 222 W. Gregory Blvd., Kansas City, Mo.*

FORK LIFT TRUCKS—The newly designed **FT** Series includes fork lift trucks powered with either a diesel or gasoline engine, available in 12 models on solid or cushion tires, in five capacities from 3000 to 7500 lb at a 24 in. load center, and 4000-lb capacity at an 18 in. load center. They are available in five standard masts with 72 to 120 in. lift.

Special features of these trucks include roller construction mast with rolled mast channels; two speeds forward and two speeds reverse single lever gear shift; quick change heavy-duty clutch; standardization and interchangeability of parts between all 12 models. *The Buda Co., Harvey, Ill.*

CLOTH-BAG DUST COLLECTOR — This collector is for such dusts as carbon black, cork, fine wood, graphite, pigments, lime, soap, metal oxides. The simplified design of filter bags and mechanism for reclaiming dust is designed to provide dust control at low equipment and installation costs.

Collectors range from 5 to 40 ft long, contain 1360 to 10,880 sq ft of filter cloth, use from one to six hoppers, and are supplied with structural supports. Bags are fastened, open end down, and each has a rubber hem at the open nozzle end to provide a dust-tight fitting to grid plate. The nozzles are clamped over grid openings in the floor of the collector.

Dust-laden air piped from the plant enters the collector just under the grid floor. The air loses velocity and the heavier particles fall into the hopper.

(Continued on page 114)

Specially Built for Recovery Process

These welded steel dump chests were installed at the Longview, Washington, plant of Weyerhaeuser Timber Company to help recover chemicals used in the sulphite pulping process. They are typical of the specialized plate work we do for industry.

Our plants are equipped to fabricate from a variety of materials including many corrosion resistant metals. Be sure to specify Horton tanks the next time you need new storage or processing facilities. Write our nearest office for complete details.

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Los Angeles 17 ..... 1574 General Petroleum Building
New York 6 ..... 3317—165 Broadway Building
Philadelphia 3 ..... 1649—1700 Walnut Street Building
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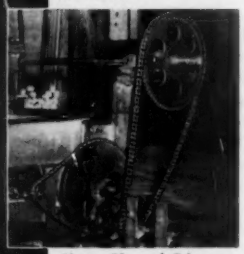
The Great Variety of Uses for Diamond Roller Chains

For Miscellaneous Plant-Built Equipment

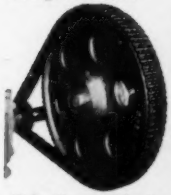
Flexibility and ease of application,—coordinating and driving a number of shafts in same or opposite direction,—transfer of power from one shaft to several,—all these are yours via Diamond Roller Chains. Speed ratios desired can be attained by selection of sprocket sizes to meet all requirements.

Left: Large Ratio Drive from floor above.



Above: Diamond Drives arranged to give very low final speed.

Below: Diamond short-center high ratio Drive.



Right: Diamond Drive from 40 H.P. motor.

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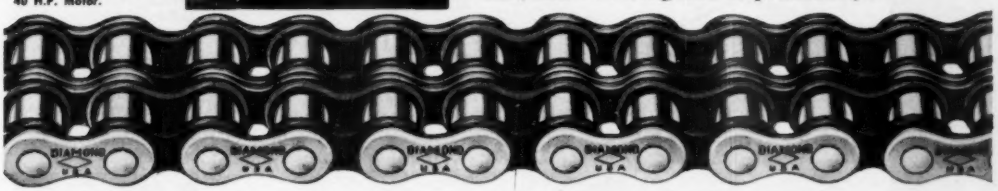
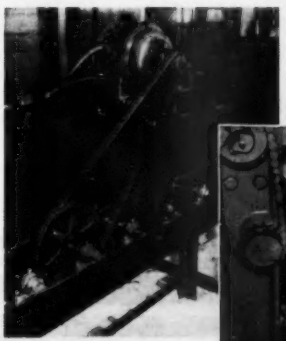
High Efficiency Power Transfer, 98-99% . . . Positive, No Slip . . . High or Low Speeds . . . Very Small or Large Horsepowers . . . Short or Long Centers . . . Small or Great Ratios . . . Quiet Operation, and . . . Long-Life Dependability.



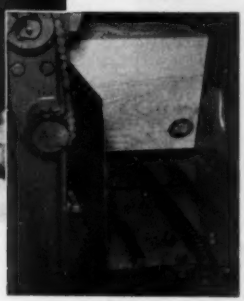
For Conveying Systems

Standard pitch size chains without or with various types of attachments are employed in a great variety of ways on conveying, materials handling, timing equipment. The long-life dependability, precision accuracy, uniformity of quality and great reserve strength of Diamond Roller Chains have made them first choice by experienced maintenance and machinery men.



Left: Main drive from motor with series of shaft-to-shaft drives.

Below: Diamond Chain on box making machine



DIAMOND CHAIN COMPANY, Inc.

Dept. 614, 402 Kentucky Avenue, Indianapolis 7, Indiana

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DRACCO SOLUTION FOR EFFICIENT HANDLING...

OPERATING COSTS *Reduced* WITH DRACCO CONVEYORS-

Combined manual and mechanical methods of moving bulk waste treatment chemicals through a Pennsylvania metal products plant were costly in terms of extra labor, production interruptions, and reduced plant efficiency.

Dracco eliminated these problems, replacing the slow manual operation with a Dracco Pneumatic Conveyor system. Bulk pebble lime and ferrous sulfate are now picked up by intake hoppers directly under railroad cars. They are conveyed 540 feet, at five tons per hour, to the Dracco receiver and storage bins on top of the waste disposal building. One man operates the system.

The fast, automatic Dracco system produced immediate and profitable results. Physical handling, labor and material costs were reduced to a minimum.

The end result of this improved plant efficiency is typical of the cost-saving technique of handling dry, bulk materials with Dracco Pneumatic Conveyors.

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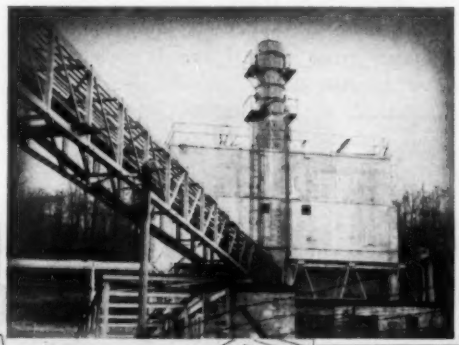
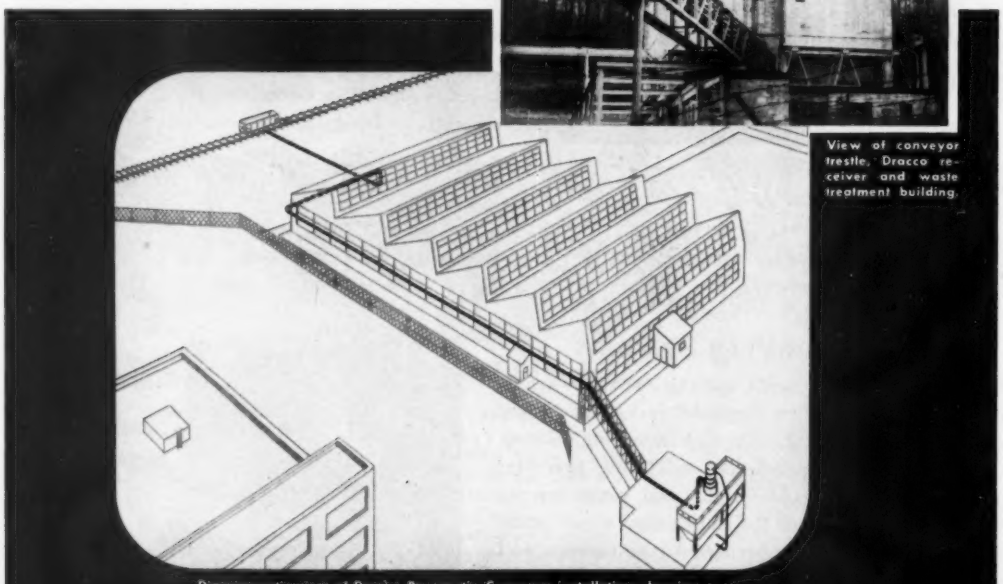
Harvard Avenue and E. 116th Street • Cleveland 5, Ohio

Further information on the advantages of Dracco Pneumatic Conveyors as applied to your materials handling problem may be had by writing the nearest Dracco representative or Dept. P-2, Cleveland, O.



View of conveyor trestle, Dracco receiver and waste treatment building.



Diagrammatic view of Dracco Pneumatic Conveyor installation showing system and piping location from existing railroad to new waste treatment building.

DRACCO TOMORROW'S TECHNIQUE FOR MATERIALS HANDLING

Performance Proved

DUST CONTROL EQUIPMENT • PNEUMATIC CONVEYORS

You can't stop a bullet with a catcher's mitt

You can't stop corrosion with ordinary paints . . .

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CORROSION can't be stopped by ordinary paints or conventional protective coatings. They can't protect surfaces against the ravages of rust for any appreciable length of time.

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BECAUSE the six Bitumastic® Protective Coatings, unlike maintenance paints, are specially formulated from a coal-tar pitch base* that is, for all practical purposes, impervious to water. And when you keep moisture away from an exposed surface, you *stop* corrosion.

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BECAUSE Bitumastic Coatings stop corrosion caused by moisture—acid fumes—alkaline fumes—corrosive soil—salt air—heat.

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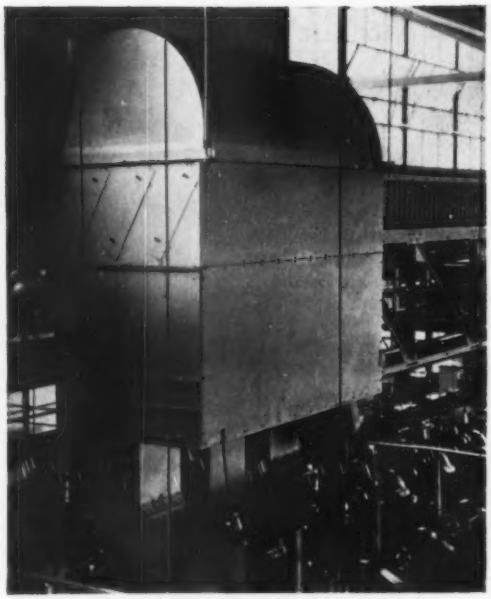

Factory Area . . . Cold Room . . . Cafeteria . . . Press Room . . . Lockers

Trane Air Conditioning Serves Everywhere in Industry

Whatever your problem may be in industrial heating and air conditioning, it can be effectively solved with products from the complete Trane line.

In Factory Areas—A lot of heat must be thrown a long way in plants such as the one belonging to an eastern fastener manufacturer. Big Trane Torridors, the high-output blower unit heaters, handle these jobs most effectively. They may be hung from the ceiling, mounted on the wall, or set on the floor to fit a particular installation.

In Cold Rooms—A research center maintained by a large manufacturer's association makes tests under many different climatic conditions. Trane Climate Changers with humidifiers are used to supply air at just the right moisture content and temperature for each desired testing condition.

In Cafeterias—To heat the large open area of its modern new cafeteria, an eastern dye manufacturer required attractive cabinet type heating units with the capacity of unit heaters. Efficient hidden heating was supplied by Trane Force-Flo Heaters recessed in the knotty pine wainscoting.

In Press Rooms—Newspaper presses operating at high speed fill the press room with an ink mist. A metropolitan newspaper used Trane Centrifugal Fans for the rapid and efficient change of air.

In Locker Rooms—Employee locker rooms in this modern factory presented a heating problem because the high lockers hindered the even distribution of heat. Year-round comfort is maintained by Trane Projection Unit Heaters with Louver Cone Diffusers. The warm air is spread out along the ceiling, and gently forced down between the lockers.

Whether it's factory areas, cold rooms, cafeterias, press rooms or locker rooms, Trane heating and air conditioning serves everywhere in industry.

Whatever your heating, cooling, ventilating, or air conditioning problem is, look for the answer in the complete Trane line.

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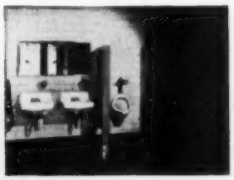
In Press Rooms—Trane Centrifugal Fans are compact, quiet, economical and efficient air handling units that are ideal for heating, ventilating, air conditioning and a great number of industrial applications.



In Locker Rooms—Trane Projection Heaters with Louver Cone Diffusers allow completely flexible control of all the air. Many diffusion patterns, from horizontal blanket to vertical shaft, may be obtained.

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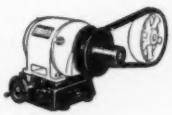
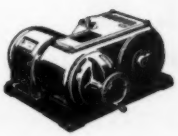
VARIABLE SPEED TRANSMISSION for providing infinite, accurate speed flexibility over a wide range—2:1 to 16:1. Sizes—fractional to 87 hp.

VARI-SPEED MOTOR PULLEY provides an instantly variable speed drive within 4:1 ratio for any constant speed motor. Sizes to 10 hp.



MOTODRIVE combines motor, speed varying mechanism and reduction gears in single unit. Speed variations 2:1 to 6:1 inclusive. Sizes to 25 hp.



Applied to your production machines, accurate, instantly variable REEVES Speed Control will produce results—*right now!* You'll see *immediate,* dollars-and-cents improvement in rate of production, quality and uniformity of product . . . *immediate* reduction in time and material loss. All because REEVES Speed Control, by providing the correct speed for every operation and every operator under every changing condition, enables both machines and men to work at top efficiency. More than 265,000 REEVES installations encompassing virtually every industry prove this statement *beyond the shadow of a doubt!* Prove it to yourself. Install REEVES on existing machines—demand it on new ones. Write for the new, 132-page catalog covering in detail the complete REEVES line. Ask for Catalog No. PE31-G.

REEVES PULLEY COMPANY • COLUMBUS, INDIANA

Recognized Leader in the Specialized Field of Speed Control Engineering

ACCURATE • VARIABLE

Reeves Speed Control

GIVES THE RIGHT SPEED FOR EVERY JOB!

WALWORTH LUBRICATED PLUG VALVES

offer these advantages

- . . . Direct port opening
- . . Quarter turn opens or closes valve
- . . . Dead tight shut-off
- . . . Freedom from attack by fluids being handled
- . . . Pressure sealed
- . . Made in a complete line. Sizes from ½" to 26" for pressures from 175 to 5,000 psi., and for vacuum requirements

THESE are just a few of the reasons why Walworth Lubricated Plug Valves give "top" performance on many *difficult* services.

All Walworth Lubricated Plug Valves employ special insoluble lubricants which protect the plug and body against contact with the line fluid, thus combatting erosion and corrosion.

The lapped surfaces of the valve are "pressure sealed" when the valve is in either the open or closed position. By turning the lubricant screw, lubricant is forced under high pressure through a grooving system that completely encircles the ports as well as the top and bottom of the plug.

The lubricant seals the valve against leakage, and reduces friction between plug and body. This permits easy, quick, full-opening, or tight shut-off with only a quarter turn of the plug.

Number 1700 (illustrated) is a Steel-iron valve, wrench operated, designed for a working pressure of 200 pounds WOG (water, oil, or gas). Valves are available in either screwed or flange types. Screwed type have API line pipe thread lengths. Flanged type (No. 1700F) is faced and drilled to American Standard for 125-pound cast iron flanges unless otherwise specified.

For further information about No. 1700 as well as the complete line of Walworth Lubricated Plug Valves, write for catalog.

WALWORTH

valves and fittings

60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

making the right
choice is simple here

...but it's easy to go wrong in choosing floors

This greaseproof SPECIAL KENTILE Floor resists hot cooking greases and oils...cleans to colorful newness with minimum of effort and expense.

THAT'S WHY IT PAYS TO CONSULT YOUR KENTILE FLOORING CONTRACTOR

CHOOSING the wrong floor for a particular room or area all too often results in excessive upkeep costs...frequent repairs or replacement. That's why it is economical as well as practical to call in the Kentile Flooring Contractor.

He is an expert with years of experience in selecting the one right floor for every flooring need...from heavy duty greaseproof flooring required for working areas to the dignified flooring best suited for offices.

Whether your problem is new construction or remodeling of areas large or small, call in the Kentile Flooring Contractor and get the most for your flooring dollar. For his name look in your classified phone book under FLOORS or write Contract Division, Kentile, Inc., Brooklyn 15, N. Y. In Canada, at T. Eaton Co. Ltd.

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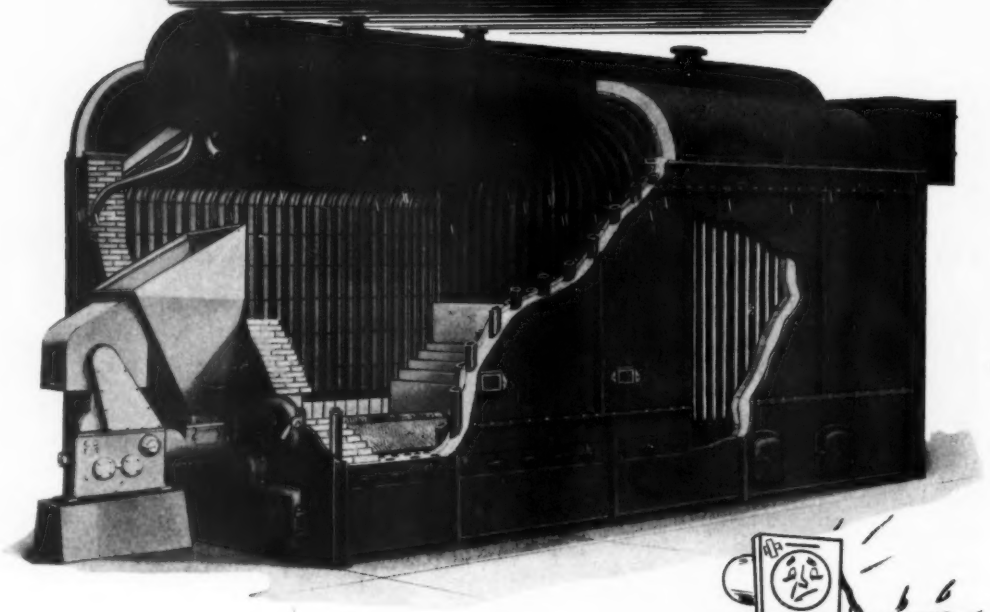
Formula for Saving Steam Dollars

300 h. p. (rated) ERIE CITY VL Boiler - Stoker unit

Factory Assembled!



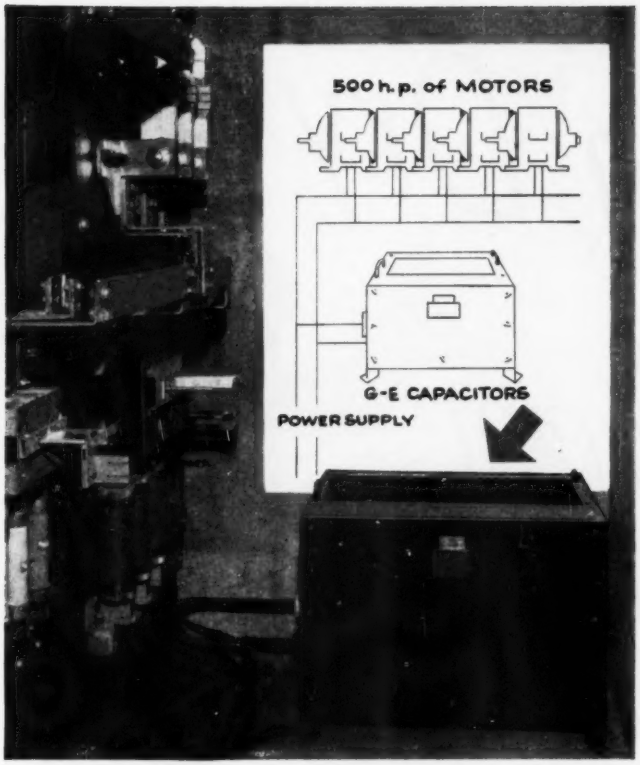
Consider this modern Erie City "VL" Steam Generator when your firetube boilers are ready for retirement. One Erie City "VL" boiler, arranged for stoker firing, as illustrated, will easily replace a battery of old hand-fired boilers, and will occupy considerably less space. You can't help but save steam dollars—with an Erie City mechanically fired "VL"—it's easy to do. With either coal, oil or gas the Erie City "VL" will give top performance. Write us for additional facts. Ask for Bulletin SB24B.

COMPLETE STEAM POWER PLANT EQUIPMENT

ERIE CITY

Complete Steam Generators • Type C 3-Drum Boilers • Types VL & VC 2-Drum Boilers • "Economic" Boiler with or without Water Walls • Welded H. R. T. Boilers • Welded Steel Heating Boilers • "Keystone" Packaged Steam Generators • Coal Pulverizers • Underfeed and Spreader Stokers • Welded Pressure Vessels for the Process Industries.

ERIE CITY IRON WORKS • ERIE, PA. • *Since 1840*



Low power factor was penalizing a West Coast meat packing plant until G-E engineers recommended the installation (arrow) of a 60-kvar, 3-phase 60-cycle, 460-volt G-E capacitor equipment.

$355 investment saves up to $47 every month!

WEST COAST MEAT PACKING PLANT INSTALLS GENERAL ELECTRIC CAPACITORS AND CUTS POWER COSTS

Induction motors caused low power factor. Because it takes about 500 hp of induction motors to run a plant that processes between 1500 and 2000 head of beef a day, a West Coast packing plant had a power factor that seldom got above 81%. Rebates on the plant's power bill were down to about $3 a month.

Power factor raised from 81% to 96%. Then G-E engineers recommended the installation of 60 kvar of G-E capacitors at a total cost of $355*. After the capacitors were installed the power factor rose to better than 96% and stayed there. Rebates on the power bill now average between $45 and $50 every month. Thus, in less than nine months, the company realized a saving greater than the cost of the capacitor equipment. ***And these monthly savings will go on indefinitely.***

*Cost of capacitor equipment in 1949. Prices slightly higher now.

Capacitors can help in other ways, too! Besides raising power factor, capacitors often permit your present distribution system to carry 20 to 30% more load without added equipment. Where voltage drop is a problem, capacitors can also provide the needed voltage boost inexpensively.

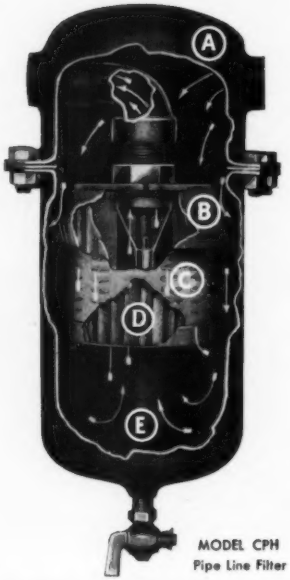
They're the key to lower power costs. This West Coast plant is just one of the many that are cutting power costs with capacitors. If your power factor is below 85% and if there is a power-factor or kva-demand clause in your power contract, chances are you can make similar worth-while savings. Your local G-E sales office or authorized G-E agent or distributor can help you—or write to Section 407-207 for booklet GEA-5632—"How to Use Capacitors to Reduce Power Costs and Gain System Capacity." ***General Electric Company, Schenectady 5, New York.***

GENERAL ELECTRIC

407-207

Clean, Dry Air

WITH STAYNEW PIPE LINE FILTERS



MODEL CPH
Pipe Line Filter

ASSURES CONTINUOUS OPERATION OF COMPRESSED AIR EQUIPMENT

And Here's Why . . .

Air operated tools, instruments, processes and pneumatic controls have one thing in common . . . they *thrive on clean, dry air*. With few exceptions, all breakdowns, repairs, and loss of productive time can be avoided by filtering air and other gases through Staynew Pipe Line Filters. Wherever air must be kept clean and dry for industrial equipment, filter it with Staynew.

Send for complete illustrated catalog on Staynew Pipe Line Filters. Write today!

Representatives in Principal Cities

- **A.** Heavy pressed steel head and body.
- **B.** Deflector cup.
- **C.** Louvred housing.
- **D.** Radial fin filter insert.
- **E.** Large capacity base.

*MODEL CPH	Horizontal Pressure Type
MODEL CP	Vertical Pressure Type
MODEL CVH	Vacuum Type
*MODEL AAPH	Absorption Type
MODEL HPH	High Pressure Type

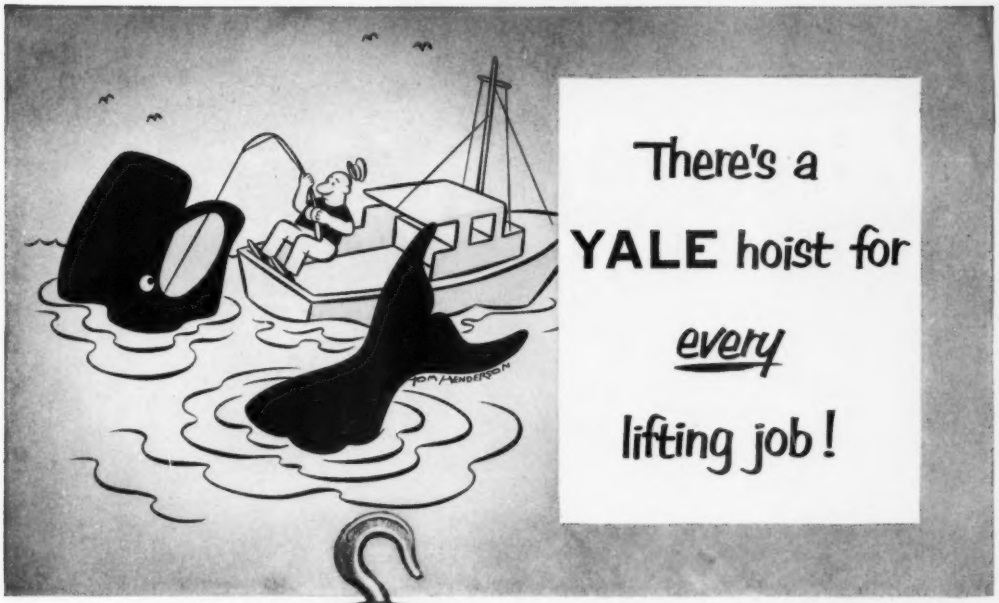
*Also available in swing bolt construction for easy inspection and servicing.

DOLLINGER PROTECTOMOTOR STAYNEW FILTERS

DOLLINGER CORPORATION

55 Centre Pk., Rochester 3, N. Y.

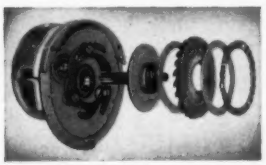
ALL TYPES OF FILTERS FOR EVERY INDUSTRIAL NEED



CAPACITIES:
½, 1, 1½ and 2 tons

THE LOAD KING ALUMINUM HAND HOIST

is light in weight, efficient in performance and truly portable. Half-ton model weighs only 36 lbs. Precision engineering, and ball bearings in *all* rotating shafts minimize friction, raise hoist efficiency *up to 95 per cent*. The Load King's many safety features include SYNCHRO-MATIC Load Brake, Alloy Steel Gears and fractureproof steel Safety Hooks.



Only the YALE Load King

gives you the safe, sure, efficient action of the SYNCHRO-MATIC Load Brake.

If your problem is to save manpower—increase production—speed lifting of any weight from 500 lbs to 40 tons—get in touch with YALE. For YALE has pioneered in the development of safer, more efficient hoisting equipment of every kind. That's why your YALE Distributor can give you such valuable assistance in choosing the *right* hoist for your particular needs. He's listed in your Classified Directory, and ready to help you any time.

The Yale & Towne Manufacturing Co., Phila. 15, Pa.
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I'm interested in lifting for less with a YALE Hoist.

☐ Please have your local Distributor call on me.
☐ Please send detailed literature on ☐ YALE Hand Hoists. ☐ YALE Electric Hoists.

Company_____

Name_____ Title_____

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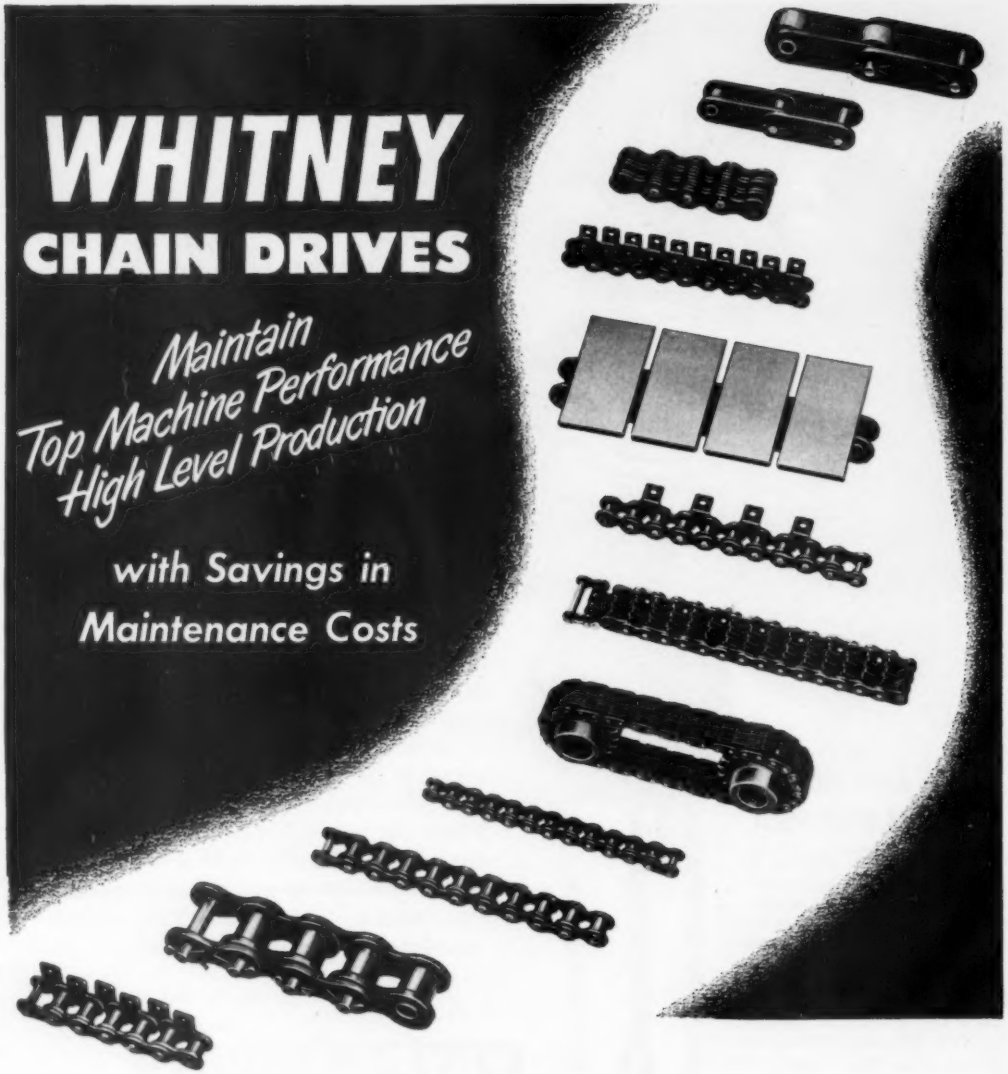
In Canada write: The Yale & Towne Manufacturing Co., St. Catharines, Ont.

YALE GAS AND ELECTRIC INDUSTRIAL TRUCKS • YALE WORKSAVERS • YALE HAND TRUCKS

WHITNEY
CHAIN DRIVES

Maintain
Top Machine Performance
High Level Production

with Savings in
Maintenance Costs



If you have a problem of positive power transmission, conveying of bottle or packaged goods, transferring bulk materials, split second timing motions, reversal of direction, Whitney Chain Drives will provide the solution with important savings in time, dollars and maintenance costs.

Besides meeting your design problems, Whitney Chain Drives insure top performance by maintaining high level production *plus* giving you the important advantage of ***keeping costly down-time*** to an ***absolute*** minimum.

From the complete line of Roller, Silent and Conveyor Chain Drives, Whitney engineers can recommend, without bias, the proper type of drive for each application . . . the chain drive which gives you the best service at lowest cost.

Consult your local Whitney Field Office or Distributor, or write direct to us for complete information and catalog.

WHITNEY CHAIN COMPANY

233 HAMILTON STREET, HARTFORD 7, CONNECTICUT

HAVE YOUR FLOORS RESURFACED by Kalman

Soundest, Most Economical Method for Recovery of Floor Life

TRAINED CREWS — *backed by 35 years' experience in installation of over 250,000,000 square feet of concrete floor. Your assurance of a resurfacing job with all the quality and long life of a new granolithic floor.*

COMPLETE REPAIR — NOT PATCHWORK

Resurfacing with Kalman topping provides a floor that is as tough, uniformly hard and as long-lasting as a new Kalman floor. It is not just a patchwork floor, repaired with other materials, but a *finished* job. Kalman "Absorption Control," the perfected Kalman process for control of water-cement ratios and absorption, assures maximum hardness and uniformity of surfaces.

- **THE SURFACE** — Uniformly hard and smooth over every square foot. No soft or weak spots. Resistant to roughest wear. Non-dusting. Easy to maintain.
- **THE TOPPING** — A dense, compact mass. Aggregate is distributed evenly.
- **THE AGGREGATE** — Hardest stone obtainable. Used in maximum concentration. Tested for hardness, toughness and crushing strength.
- **THE POINT OF ADHESION** — Correctly prepared for absolute adhesion of topping.

TOUGHER — UNIFORMLY HARDER — LONGER-LASTING

Kalman CONCRETE Floors

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BRANCH OFFICES: Boston • Charlotte • Chicago • Cleveland • Dayton
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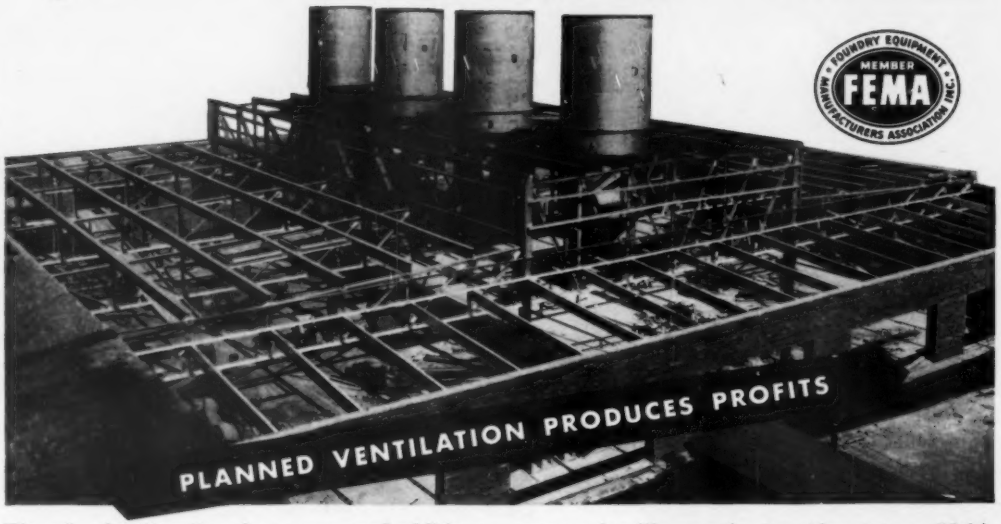
ELIMINATE *Extra* EXPENSE

include in the plans a MULTI-WASH System

for that new foundry or addition



FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

Plans for that New Foundry or proposed addition should include a Schneible Multi-Wash Dust Collecting System. Important savings may be realized if Multi-Wash Collectors are installed while a foundry is being erected because (1) they may be placed in position without the need of special rigging, (2) where units are installed through or on the roof there is no need for cutting existing framework, special fitting or flashing and (3) where a large system is involved (as illustrated above) it is less expensive to move the sections to the site and erect them without interference from walls, equipment or workers.

Clean, dust-free air is a must in modern planning. Get the benefits to be derived from a Multi-Wash system, it will more than pay the expense. Multi-Wash is the ultimate of simplicity in dust control. The air is washed continuously . . . dust and fumes are removed and converted into innocuous sludge. The sludge is dewatered periodically in a settling tank for removal from the premises in a damp, dustless state; the clear water is recirculated through the system.

Multi-Wash is quiet, efficient and trouble-free . . . making it inexpensive to operate. For further information or assistance in your foundry planning, call the local Schneible engineer or write direct.

Your inquiry will receive expert attention.

CLAUDE B. SCHNEIBLE COMPANY • P. O. Box 502, Roosevelt Annex, Detroit 32, Mich.

PRODUCTS:

Multi-Wash Collectors • Uni-Flo Standard Hoods • Uni-Flo Compensating Hoods • Uni-Flo Fractionating Hoods • Water Curtain Cupola Collectors • Ductwork • Velocitrap • Dust Separators • Entrainment Separators • Settling and Dewatering Tanks • "Wear Proof" Centrifugal Slurry Pumps

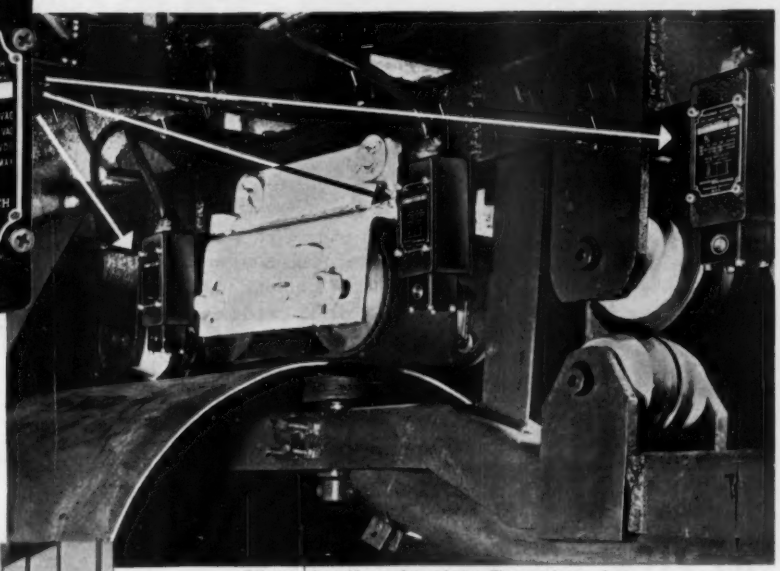
SCHNEIBLE

MANUFACTURERS • ENGINEERS • CONTRACTORS

Plant engineer installs six
MICRO Precision Switches
for automatic control of grit blasting fixture

The 1ML1 MICRO LIMIT Precision Limit Switch . . . a rugged, heavy duty, sealed precision limit switch with many adjustable features. Also available with straight plunger actuator and roller plunger actuator for "in line" operating motion.

Three MICRO 1ML1 limit switches shown on grit blasting fixture in factory of Thompson Pipe and Steel Company.



Full view of grit blasting fixture built in Thompson's own shop

Plant Engineer Fred Sebring of Thompson Pipe and Steel Company, Denver, installed six MICRO limit switches on a grit blasting fixture which permit automatic control of the cleaning of pipe seams prior to welding.

The formed pipe is pushed into the fixture and three limit switches, operated by contact with the pipe, take over the control of the blasting and start the feed motor, which returns the formed pipe by means of the feed chain. The other three switches, operated by a dog on the feed chain, stop the feed motor. They are placed in sequence on the fixture to accommodate different lengths of pipe.

Plant production men in every type of industry are giving old equipment new life and lowering production costs by the use of MICRO precision switches. Write today for your copy of MICRO TIPS . . . full of practical ideas like this.

There is a MICRO SWITCH Distributor near you. They are located in 122 cities. Look under "Switches, Electric" in your classified phone book.

Write for your copy of "MICRO TIPS" today

It's full of practical ideas. "MICRO TIPS" will be mailed to you regularly on request.

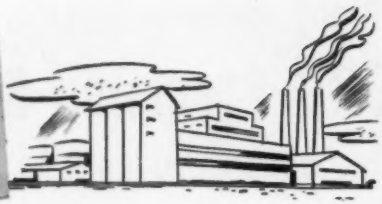
MICRO SWITCH

FREEPORT, ILLINOIS

MICRO Snap-Action Switches . . . Honeywell Mercury Switches

A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

FROM PAPER MILLS...



TO BREWERIES

CHECK CORROSION FROM ACIDS AND ALKALIES LONGER WITH

The unexcelled resistance of rubber-base paints to acids, alkalies, bleach solutions, and chlorine makes them ideal maintenance finishes for paper mills and breweries.

Economical to use, easy to apply, these tough coatings offer money-saving protection to metal surfaces . . . are especially durable on concrete, since they resist both abrasion and the free alkali in cement.

Rubber-base paints resist corrosion three to four times longer than ordinary coatings. Exceptionally satisfactory service results are obtained in numerous industries where surfaces are attacked by acids, alkalies, and salts.

These paints dry quickly . . . seal surfaces against corrosive solutions, temperature changes, and humidities. Ask your paint supplier for details or write:

HERCULES POWDER COMPANY
INCORPORATED
Cellulose Products Department
966 Market Street, Wilmington, Delaware

RUBBER-BASE (PARLON)® PAINTS

CR52-1

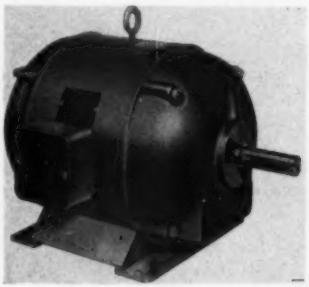
(Continued from page 98)

The air then rises through the grid into filter bags, on its way to the top outlet. Captured dust is removed by shutting down the exhauster and starting the shaker motor. Shaken dust is discharged through a valve at the bottom of the hopper. *Pangborn Corp., Hagerstown, Md.*

STAINLESS STEEL COATING — Steelcote may be applied by brush or spray to all metal surfaces, manufacturer announces, to protect them against rust, corrosion and deterioration by salt air, water, alkalis, oils, greases and many acids, as well as heat, cold and sunlight. The coating dries for use in 3 or 4 hr, producing a noninflammable, odorless film. An important use of Steelcote is the coating of machinery that would be ordinarily made of stainless steel, but is now being made of other materials because of the steel shortage. Steelcote comes in 1 and 5 gal containers and its cost is given at approximately 4¢ per sq ft. *Steelcote Mfg. Co., 3418 Gratiot St., St. Louis Mo.*

STANDARD MOTORS — Four new frame sizes have been added to this manufacturer's All-Weather line, expanding this line to include 125 hp ratings. The highest previous rating was 50 hp. The four new ratings will be made in NEMA frames 444, 445, 504 and 505.

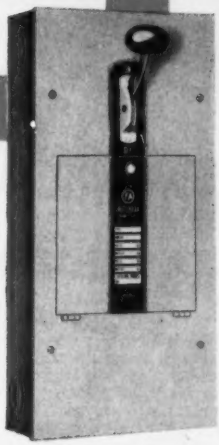
The motors are designed for all-weather operation, given special treatment to resist moisture and corrosion. Wide, pre-lubricated ball bearings will

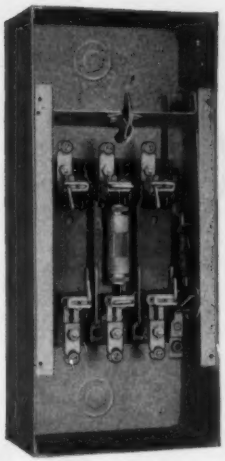


not require lubrication for five years under normal operating conditions, company states, adding that the extra insulation between each coil provides far more protection than insulation used between phase groups only. End-to-end ventilation is provided, and auxiliary air passages in rotor core assembly enable the air to circulate through the rotor. *Robbins & Myers, Inc., Springfield 99, O.*

TEFLON BELLOWS CONNECTOR — Fabricated of chemically inert Teflon, the new John Crane Bellows Type Connector has many pipe line applications where vibration, expansion and electrolysis exist in the handling of corrosive liquids or gases and solvents. This connector is electrically nonconductive,

Here's a Switch that thrives on WORK!





Ample wiring space at top, bottom and rear, plus a removable switch unit speed installation.

SHUTLBRAK

Type A

ENCLOSED SWITCHES

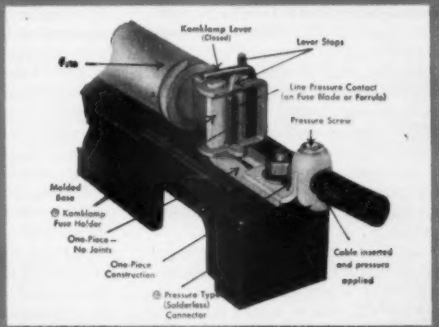
Ⓐ Type A Shutlbrak Switches are an answer to industry's need for a high quality, long lasting, trouble-free heavy duty switch.

Featuring quick make and break operation, these safe, dependable switches have inter-locking fuse doors which automatically lock when the current is "on" and permit access when the switch is "off" (An intermediate position of operating handle provides access only by authorized persons.)

Underwriter Laboratories-approved, Ⓐ Type A Shutlbrak Switches are ideal for motor control, service entrance or for any job requiring a heavy operating switch. They can be effectively used also for panelboard and switchboard assemblies.

Capacities are 30 to 1200 amps, 250 volts AC or DC and 575 volts AC in 2, 3 and 4 poles. For further information contact your nearest Ⓐ representative or write for bulletin 501.

Ⓐ Type A Shutlbrak Switches provide split-second speed of operation with a new shuttle mechanism and heavily silvered copper contacts that roll under pressure and actually improve with use.



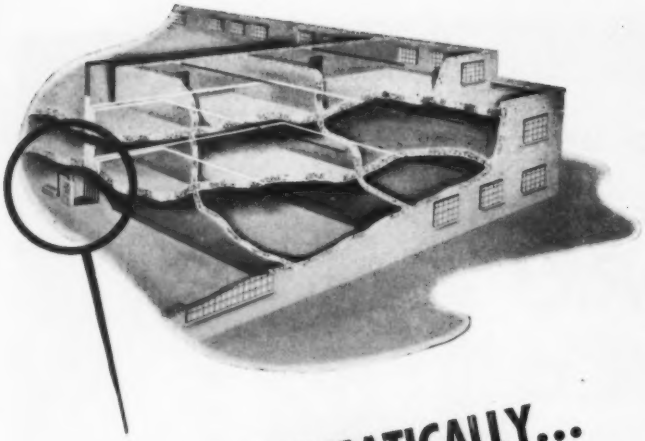
KAMKLAMP FUSEHOLDERS have silver plated pressure type contacts to reduce heating and eliminates the need for auxiliary means of obtaining pressure between fuse terminals and fuseholder. Solderless type pressure connectors are another feature.

Frank Adam Electric Co.

P. O. BOX 357 ST. LOUIS 13, MISSOURI

Our 61st Year

Makers of BUSDUCT • PANELBOARDS • SWITCHBOARDS • SERVICE EQUIPMENT • SAFETY SWITCHES • LOAD CENTERS • QUIKHETER



DETECTS AUTOMATICALLY... SMOKE, SMOLDERING AND FIRE

at any location in your plant or warehouse!

Each fire hazard point gets highly efficient, round-the-clock fire watchman service simultaneously when a building is completely protected with a modern, fully approved C-O-TWO Automatic Smoke Detecting System.

The first whiff of smoke sets off an alarm, based on an exclusive operating principle . . . no chance of smoke, smoldering or fire spreading . . . instantly, the air conditioning shuts down, doors and dampers close, operating equipment stops and fire extinguishing systems actuate . . . a truly automatic fire watchman.

Four types of smoke detectors and several different installation arrangements are available to fit your particular needs...single space systems, double space systems, multiple space systems, air conditioning duct systems . . . all function by drawing continuous air samples through simple piping to a smoke detector.

Actual fire tests made by the Underwriters' Laboratories, Inc. show that fire detection with this type of smoke detecting equipment is much quicker than other methods . . . because usually there is smoke or smoldering before flames break out.

Remember fire doesn't wait . . . so, with current expensive delayed replacements, why not let an expert C-O-TWO Fire Protection Engineer help you now in planning economical, fully approved fire protection facilities. Write today for complete free information.

C-O-TWO

C-O-TWO FIRE EQUIPMENT COMPANY

NEWARK 1 • NEW JERSEY

Sales and Service in the Principal Cities of United States and Canada

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MANUFACTURERS OF APPROVED FIRE PROTECTION EQUIPMENT

Squeez-Grip Carbon Dioxide Type Fire Extinguishers • Dry Chemical Type Fire Extinguishers Built-In High Pressure and Low Pressure Carbon Dioxide Type Fire Extinguishing Systems Built-In Smoke and Heat Fire Detecting Systems

flexible even at -94 F and as strong at 480 F as at 70 F, according to manufacturer.

The new connector serves as a vibration dampener as well as an expansion joint, it is stated; it connects misaligned couplings and insulates flanges electrically. End flanges of the joint are French-type envelope gaskets made integral with the joint for easy assembly between companion flanges and a tight seal on installation. A booklet on the connector is offered by manufacturer. *Dept. M29, Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.*

TRACTOR SERVICE TOOLS — Set CT-6 contains tools designed for use on the larger Caterpillar Tractors such as the D8, but especially on the DW-20 and DW-21. Developed with the cooperation of Caterpillar engineers, these tools provide a wide range of utility and handle most of the pulling and installation operations involving gears, bearings, pulleys, shafts, sprockets, bushings. With Set CT-6 these jobs can be done with a substantial saving of time and without damage to parts, company points out. Tools are described in Bulletin CT-50, available on request. *Owatonna Tool Co., 446 Cedar St., Owatonna, Minn.*

OIL HANDLING PUMP — The IMO A313B is a new low cost pump for higher pressure applications—manufacturer says it saves up to 40 per cent in initial cost over other IMO models for similar pressures. The new pump is designed for a wide variety of oil handling applications.

A rotary positive displacement pump, it offers all advantages of company's IMO design. It has only three moving parts. It is described as quiet, pulsation-free, compact and excellent for high-speed operation. It can be used for capacities to 80 gpm, pressures to 275 psi and intermittent pressures to 325 psi. It handles light or viscous fluids in hydraulic systems, rotary and steam atomizing oil burners, lubrication, governing systems. This pump is fully described in Bulletin L313B, available from manufacturer. *DeLaval Steam Turbine Co., Trenton 2, N. J.*

IMPROVED FLOOR RESURFACER— Uintahlite, a high efficiency mineral stabilizer, is now utilized in the formulation of Texas Jack Resurfacer (a high density mastic flooring), to give it greatly increased stability and compressive strength. The new ingredient is a mineral generally grouped as a form of native asphalt, but classified by technologists as different from asphalt or bitumens—it has properties found in coal, tar, pitch and asphalt. Company says it doesn't soften in hot sun or dissolve in water, and has extra high resistance to corrosion by acids and alkalis.

Additional benefits reported from the use of this stabilizer in Texas Jack Resurfacer include reduced "pull" on vehicular traffic and elimination of indentation under static loadings. Propul-

WHEN THE WORD COMES TO . .

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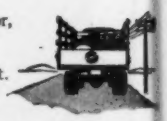
The urgency of America's defense program calls for a lot of speed on the part of American industry. And for a lot of new roofs, too! New roofs on new plants . . . and new roofs, or repairs, on old plants, as well.

Nearly 100 years of experience in meeting roofing demands of every kind have fitted Barrett to give you the world's longest-lasting built-up roof in the shortest possible time. For Barrett *speeds* your roofing jobs in 4 important ways.

1 **BARRETT SPEEDS** specifications. Ready at hand are Barrett time-tested, scientifically calculated application specifications for almost every built-up roofing problem. These are so foolproof that Barrett Specification* Roofs can be bonded for 20 years, and generally last much longer. Approved by the National Board of Fire Underwriters—Class A.

2 **BARRETT SPEEDS** deliveries. Strategically located supply points enable us to rush materials to your Barrett roofing contractor, and to your job when they are needed. Barrett does not have to rely on outside sources of supply for roofing pitch and felt. Because Barrett Specification* pitch and felt are made in our own factories, production can be controlled to meet demands. Your Barrett roofer can be sure that he will get the materials he wants when he needs them.



3 **BARRETT SPEEDS** application. The Barrett Roofer can be sure that roofing materials will be of uniform high quality. Application goes smoothly because there is no defective felt or pitch to interrupt and slow down operations. No time lost on the job!

4 **BARRETT SPEEDS** you the finest possible roof. Skilled workmen make for fast jobs. Barrett Approved Roofers have had many years of practical experience, plus well-trained manpower, plus Barrett engineering help, to assure you the finest possible roofing job in the shortest possible time.

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READ STANDARD'S engineered-for-production program has resulted in the acceptance of Standardaire Blowers for virtually every important industry. Blowers are currently being produced for a wide range of applications in a rapidly expanding market — and in many instances to suit specific requirements and specifications. The amazing acceptance of Standardaire Blowers is indicative of their superior operating characteristics, high efficiency and dependable performance in round-the-clock service. For further details we invite you to consult with our engineers. They will be glad to study your air or gas problems and make recommendations. Write Dept. F62

READ STANDARD CORPORATION,
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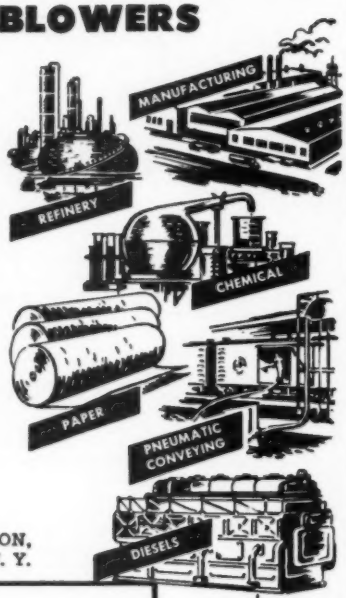

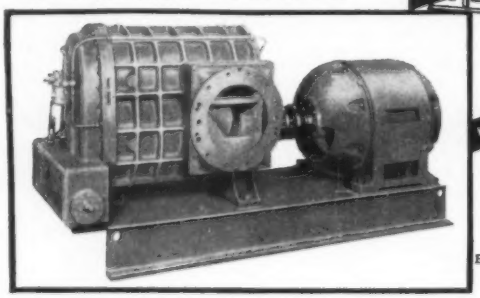

Standardaire 1218B23 Blower to deliver 2890 c.f.m. at 1160 r.p.m.

Engineers like the STANDARDAIRE principle

RECENT BLOWER USERS: Amalgamated Sugar Company • Brillo Manufacturing Co., Inc. • Chicago Pump Co. • Cleaver-Brooks Company • Dow Chemical of Canada, Ltd. • E. I. DuPont de Nemours & Co. • Fairbanks, Morse & Company • Hercules Powder Co., Inc. • Hills Bros. Coffee, Inc. • Husky Oil Co. • Koppers Company, Inc. Monsanto Chemical • National Advisory Committee for Aeronautics • Ozark-Mahoning Co. • United States Navy • Standard Brands, Inc. • West Jersey Paper Manufacturing Co.

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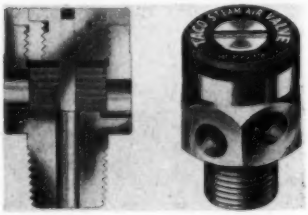
sion effort is also reduced. A further feature of Texas Jack floors is compatibility to a coal tar water emulsion made by the same company which, when thinly coated over the mastic floor, is claimed to give almost complete protection against oils, gasoline, many solvents, and acid and alkaline solutions. Information on the new Texas Jack Resurfacer is given in a booklet furnished by manufacturer. *Flash-Stone Co., Inc., 30 E. Rittenhouse St., Philadelphia 4, Pa.*

VERSATILE PALLET TRUCKS—Hand lift pallet trucks are now available with a dual-purpose superstructure that enables them to handle 7- and 12-in. skids as well as single or double faced pallets. When the superstructure is in a raised position, it is clamped vertically to provide a backrest for the pallet load on the truck. When lowered, it is adjustable to either skid height by a cam and slot arrangement. The truck is available in either mechanical or hydraulic lifts. Manufacturer points out that this truck will find application in plants where there isn't sufficient use of either skids or pallets to keep a specialized truck for each busy, or where flexibility is desired because of varying loads. Platform trucks can be similarly equipped—further details will be supplied by company. *The Yale & Towne Mfg. Co., 1100 Roosevelt Blvd., Philadelphia 15, Pa.*

STEAM AIR VALVE—This new air valve for steam heating systems works on a new principle and measures only ¾ by 1 in.—less than a quarter of the size of many air valves. Company explains that in this valve air is forced out between special composition discs by steam pressure. As steam enters



the valve, moisture in the steam starts to swell the discs, which are sized and of such material that they will not completely seal until all air has been forced out and the valve is full of steam. After the thermostat is satisfied and steam subsides, the system may go into a vacuum for a few minutes, after which the discs dry and shrink and are ready for another cycle.

Features stressed for this valve are its quiet operation, compactness, and efficiency. It can be installed in any position except upside down, can be manually operated when necessary. *Taco Heaters, Inc., 137 South St., Providence 3, R. I.*

LINE TYPE PURIFIER—For installation in compressed air, gas, vapor and steam lines, this unit is the latest of

HALL can help find the answers to *Your* water problems . . .

here are a few examples:

METAL

2 miles of buried water mains, many service lines fed water-cooled elements of equipment in metal refining plant. Water left heavy scale on cooling elements, causing failure. Corrosion of main lines developed. Hall and the refinery stopped both scale and corrosion with Threshold treatment.

HALL

PAPER

Paper rejects were high due to poor sizing. Since water was blamed, Hall engineer made plant study, found that sizing procedure on one shift was not properly controlled. Situation was corrected and trouble stopped. Hall Engineer helped paper company find the trouble even though water wasn't responsible.

HALL

POWER

Routine check of 18,000 lb. per hr. boiler by Hall Service Engineer showed proper water conditions. Hard deposit found under normal sludge in mud drum was a "stopper." Hall report suggested heat leakage against drum. A check showed that packing between bridge wall and drum was gone. The Hall Engineer *predicted* the trouble in this case.

HALL

CHEMICAL

To speed up batch thermal processings of vegetable oils, plant engineers used extended-surface exchanger tubes. After repeated corrosion failures, Hall was consulted. Hall helped plant engineers effect design changes and set up chemical treatment. Processing units now stay in production.

HALL

WATER SUPPLY

Expanding plant needed more water. Before drilling new wells, Hall was consulted. Hall helped solve a stubborn slime problem, synchronized supply and demand, reduced water consumption 50%—then doubled well capacity with new well-cleaning method. Result: No new wells, plenty of water for planned expansion, money saved.

HALL

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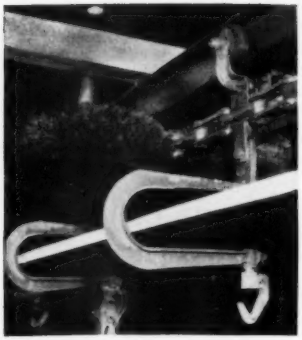
YOU take no chances when you specify leading brands. They've *got* to be good...top quality merchandise...dependable service.

You are sure to get the best in workmanship and materials when you specify OSBORN industrial brushes, for they are backed by 60 years of service to industry.

And it's simple to buy Osborn brushes. Just order them automatically from your Industrial Distributor along with other mill supplies. Write for handy pocket catalog. *The Osborn Manufacturing Company, Dept. 626, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

Osborn Brushes

OSBORN POWER, MAINTENANCE AND PAINT BRUSHES AND FOUNDRY MOLDING MACHINES



SOLVES PROBLEM. Two Osborn Disc-Center* Wire Wheel Brushes, mounted as shown, remove dirt and scale continuously from conveyor as it operates. Eliminates former dismantling, down-time and cleaning expense. Problems of all kinds . . . maintenance and production . . . are being solved every day with Osborn power brushes.

SAVES TIME. Why not adopt a standard policy of saving time by specifying OSBORN on all requisitions for paint, maintenance and power brushes? No need to "shop around." You *know* you're getting top quality and low end-of-service cost with OSBORN brushing tools.

STREAMLINES BUYING. You can make one order cover OSBORN Brushes and other leading-brand mill supplies when you buy from your Industrial Distributor. He can supply the right OSBORN Brushes for your every need, promptly. This standard practice streamlines your purchasing, cuts your supplies inventory, assures you good service.

*Trademark

manufacturer's Hi-eF Series; it has many applications in the chemical, petroleum and metal working industries. These include the removal of guck and entrained solids from exhaust steam installations; removal of condensate from compressed air lines; delivery of clean, dry steam for food processing; prevention of process gas and air lines from becoming contaminated with line scale and liquids, and removal of entrainment from vapor lines following evaporation.

Advantages announced by manufacturer other than low initial cost are self-cleaning action, good design which reduces pressure drop, large slug capacities and broad range of capacities. Units have forged steel flanges with welded steel bodies. For further information write for Bulletin 200 for 2½- through 24 in. sizes, Bulletin 500 for ½- through 2 in. sizes. *The V. D. Anderson Co., 1935 W. 96th St., Cleveland 2, O.*

FLOOR PATCHING—Broken floors can be restored quickly with Instant-Use, manufacturer reports, and it's not necessary to close off an area of industrial floor while waiting for the newly installed patches to set, because this patching material takes traffic almost as soon as it's put down. The material is simply shoveled into the hole or rut and tamped. Instant-Use is especially recommended for repairing breaks in concrete due to relocating machines, according to company, but is also efficient for complete overlays. Trial order plan and descriptive folder are available on request. *Flexrock Co., 3620 Filbert St., Philadelphia 4, Pa.*

CABINET UNIT HEATERS — Three new models have been added to manufacturer's line of Force-Flo Heaters, and the entire line streamlined in design to simplify maintenance. New models include a free-standing unit, Type FG; a semi-recessed design, Type SG, and a completely recessed cabinet, Type RG. All have front inlet and outlet grilles for blanketing doorways or areas where air must be discharged horizontally from the unit. The units are intended for use wherever a high volume of heat is required from an attractive source.

Design improvements include a removable cabinet front, grilles that are integral parts of the cabinet, and a new headering system that permits concealed piping in any position. Twin centrifugal fans, pushing air out over fin and tube heating coils, enable the heaters to block cold drafts and raise room temperatures quickly. Units can be installed in either steam or hot water systems, with capacities to 105,000 Btu. Force-Flo Heaters are described in Catalog DS-314. *The Trane Co., La Crosse, Wis.*

DUAL PURPOSE VALVE—Really a valve within a valve, the 125-lb cast iron No. 818 consists of a 12-in. beveled vane which seats against the body side wall with a 4-in. vane mounted

Yes, Lockheed in California can train you – at full pay!

The step up to Aircraft Engineering isn't as steep as you might expect.

Aircraft Experience isn't necessary. Lockheed takes your knowledge of engineering principles, your experience in other engineering fields, your aptitude, and adapts them to aircraft work. You learn to work with closer tolerances, you become more weight conscious.

What's more, Lockheed trains you *at full pay*. You learn by doing – in Lockheed's on-the-job training program. When necessary, you attend Lockheed classes. It depends on your background and the job you are assigned. But, always, you learn at full pay.

These opportunities for engineers *in all fields* have been created by Lockheed's long-range production program – building planes for defense, planes for the world's airlines.

And remember this: When you join Lockheed, your way of life improves as well as your work.

Living conditions are better in Southern California. The climate is beyond compare: Golf, fishing, motoring, patio life at home can be yours the year 'round. And your high Lockheed salary enables you to enjoy life to the full.

Note to Men with Families: Housing conditions are excellent in the Los Angeles area. More than 35,000 rental units are available. Thousands of homes for ownership have been built since World War II. Huge tracts are under construction near Lockheed.

Send today for illustrated brochure describing life and work at Lockheed in Southern California. Use handy coupon at right.

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Dear Sir:

Please send me your brochure describing life and work at Lockheed.

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HOW MUCH ARE SLIPPING ACCIDENTS COSTING YOU?

ACCIDENT REPORT

Cause of accident:
Man fell on a slippery floor.

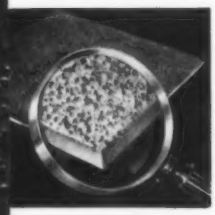
Means of prevention:
Install A.W. ALGRIP Abrasive Rolled Steel Floor Plate.

There's an easy, economical way to end slipping accidents that steal man-hours and drag production down. Put positive non-slip protection in your plant with exclusive A.W. ALGRIP Abrasive Rolled Steel Floor Plate.

NON-SLIP—EVEN ON STEEP INCLINES!

ALGRIP is made by rolling tough abrasive grain (the same kind used in grinding wheels) *uniformly* as an integral part of the steel plate's upper portion. When you walk on ALGRIP, hundreds of tiny safety brakes grip your feet at every step. *Result:* It's virtually impossible to slip—even on steep inclines.

WEAR WON'T WEAR OUT ITS SAFETY!



ALGRIP's safety isn't merely a surface treatment. Note the even distribution *and* depth of the abrasive grain. As the surface wears, new particles are exposed, so ALGRIP keeps its non-slip qualities for a lifetime. It needs no maintenance. Rolled steel makes it stronger than other abrasive floorings. It withstands hard blows and heavy loads without cracking or breaking. And thinner sections can be used without reducing load carrying capacity.

Get Full Details of ALGRIP Today

Our new Booklet A-5 gives complete technical details, suggests uses. Write for your free copy. *It may save you countless hours and dollars!*

A.W. ALGRIP ABRASIVE ROLLED STEEL FLOOR PLATE

ALAN WOOD STEEL COMPANY
Conshohocken, Pa.

Other products: PERMACLAD Stainless Clad Steel • A. W. SUPER-DIAMOND Floor Plate • Plates • Sheet • Strip • (Alloy and Special Grades)

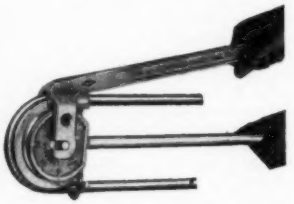
Over 125 years of iron and steel making experience.

in the center of the larger vane. The No. 818 is for use in a turbine bypass line for controlling required quantity of water when turbine is not in use or is operating at reduced capacity. It is equipped with 18-8 shafts, bronze bushings and two lubricated stuffing boxes with two outboard bearings. Both vanes are motor operated. Designed for either a high pressure drop and small volume or a low pressure drop and large volume, this type of valve may be furnished with a small free revolving vane. It is available in various combinations of sizes and for elevated or sub-zero temperatures, manual or automatic control. *R-S Products Corp., 4600 Germantown Ave., Philadelphia 44, Pa.*

PORTABLE CHROME PURIFIER—Now available is a portable version of the Illco-Way Chrome Purifier for recovering and purifying chromic acid anodizing baths, and for reclaiming plating and rinse waters. One of manufacturer's newer developments in ion-exchange engineering, the purifier is designed to eliminate the need for discarding chromic acid which is normally replaced with fresh acid to maintain a required pH and acid concentration. Contamination of the acid solution is kept at a minimum when processed by this method, it is claimed. *Illinois Water Treatment Co., 840 Cedar St., Rockford, Illinois.*

2-IN-1 TUBE BENDER—This combination tube bender, the No. 362-F, bends both ½- and ⅝-in. OD copper, aluminum, brass and other soft, thin-wall metal tubing. It has a dual size shoe and mandrel which permits bending two different sizes of tubing without changing any parts.

The bender is of two-piece construction; it comes apart and slips over the



tube at the point where the bend is needed. Thus it can be used to bend tubing where one end is connected as easily as that in which both ends are free, company points out, and this construction also makes it easy to remove the bender from tubing after bend is completed. Bends can be made to any angle to 180 deg and bender is calibrated to show degree positions. Made of steel and aluminum, bender weighs 3 lb, is 21 in. long. It is described in manufacturer's Bulletin 3001. *The Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago 7, Ill.*

LUBRICANTS—Three recently announced lubricants include a new premium anti-friction bearing lubricant called High Temp Grease, a new for-

Industry looks to
Powell for the latest
in valve design
When new methods and processes create new flow control conditions, Powell is always ready with valves of correct design and materials to meet them.
That is why there are more kinds of Powell valves in service today than any other make.
The Wm. Powell Co.
Cincinnati 22, Ohio
Fig. 2608. 200-pound Bronze Globe Throttling Valve. A Powell design that permits full flow through the seat when wide open. Has special bronze stem and stainless steel disc and seat.
POWELL
BRONZE, IRON, STEEL AND CORROSION-RESISTING VALVES
DEPENDABLE VALVES
SINCE 1846

Buschman "CONVEYOR"

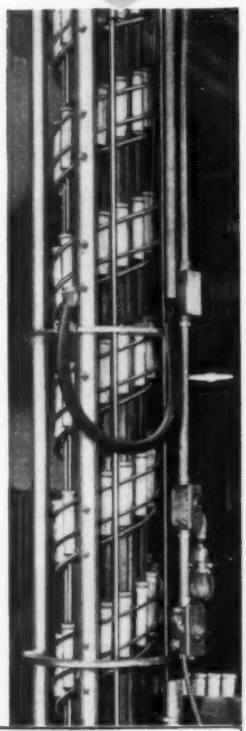
FILLS GAP IN HIGH SPEED Alka-Seltzer PRODUCTION LINE

★ *Eliminates Manual Handling*
★ *Minimizes Breakage*
★ *Handles 200 Glass Bottles per Minute*
★ *Saves Space*

Bottles of Alka-Seltzer tablets were being produced on a new line at a 50% increase . . . 200 glass bottles per minute. Production bottleneck however existed between filling and final labeling . . . bottles were moved from second to first floor via trucks and elevator by twelve workers on three shifts.

Now, without handling, bottles move on a slat conveyor to the Buschman lowering machine and are spiralled quickly and gently to the labeling machine on the floor below. Completely engineered by Buschman, this conveyor easily handles the increased production, occupies just 1½ square feet of floor space.

Ingenious solution of handling problems is a Buschman specialty based on long experience moving practically any product or part faster, easier and at lower cost. Write for detailed literature describing standard section "Roll-or-Wheel," Overhead Cable, and Engineered Conveyors.



PRODUCE MORE . . . FOR LESS on Buschman Conveyors

THE L. W. BUSCHMAN CO., INC.
4426 CLIFTON AVENUE
Cincinnati 32, Ohio

mulation of company's Crater A for wire rope, and an improved muti-purpose grease, Multifak 2.

High Temp Grease is said to extend the efficient operating range of ball, roller and plain bearings at high temperatures. Company says it exceeds established industrial standards in affording unusual protection up to 300 F for continuous operation, and to 350 F for intermittent operation. Its water resistance makes it applicable in jobs where long retention of grease and resistance to washing out are factors.

The new Crater A is formulated to achieve improved wettability while retaining desirable characteristics of the previous product. It is described as especially valuable for use in severe weather conditions, where, wire rope is wet when lubricant is applied, or where cable is subjected to abnormal water conditions in use, since it will penetrate and adhere to wet wire rope. A thin liquid, applied without heating, Crater A remains pliable under a wide range of atmospheric conditions.

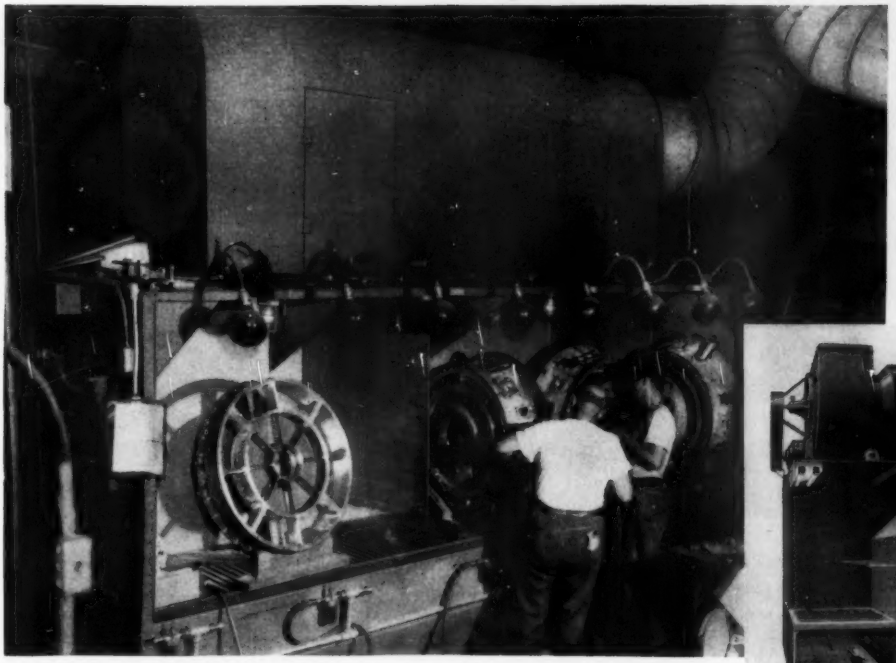
Multifak 2 Grease is suggested for use in situations requiring one high grade multi-purpose grease for a variety of operations. Company research men point out that Multifak 2 has excellent shear stability and resistance against water washing, as well as good pumpability at low temperatures. Information on Multifak 2, Crater A and High Temp Grease is available from manufacturer. *The Texas Co., 135 E. 42nd St., New York, N. Y.*

LINE MARKER—The Florline X is a new version of company's marking machine developed to mark safety and parking lines within ⅛ in. of partitions, aisleways, tool cribs, machines and stock. It operates on the same gravity feed principle as the standard model, making lines at walking speed. It can be operated by one man, using one hand to guide and control it, company explains, and the brush can be raised by a lift of the hand to retrace a line, make skip lines or roll to other areas. Paint flow is adjustable by pistol-grip trigger control and the machine holds 1½ gal of paint or whitewash—enough for approximately 1200 ft of 4 in. line. The Florline X weighs 20 lb, retails at $98.75. *H. C. Sweet Co., 12083 Woodbine Ave., Detroit 28, Mich.*

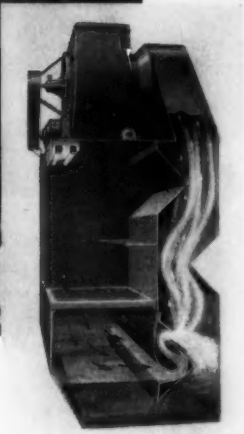
UNIVERSAL pH METER—This new instrument is designed for all pH and rH work, for potentiometric titrations and for oxidation-reduction-potential investigations. Company says it provides a measuring accuracy of 0.01 pH or 0.5 mv, a range of 0 to 14.15 pH and 0 to 1415 mv, currentless measuring with no phenomena of polarization, zero indication by cathode ray tube, can be used with glass, quinhydrone, hydrogen and platina electrodes and is direct calibrated for the first three.

The meter is supplied with a removable calomel and glass electrode and provided with controls to correct for temperature variations and for asymmetric potentials. It has a built-in cadmium standard cell and flexible cable with

air as clean as you like it!



ROTO-CLONE Type N Bench exhausting light metal burring operation.



ROTO-CLONE Type N Bench cutaway showing single impeller.

CLEAN AIR speeds production for light metal jet parts

AAF ROTO-CLONE Type N Bench Eliminates Dust Nuisance from Finishing Operations.

The aluminum parts shown above soon will be traveling at speeds approaching the sonic barrier. They are the mid and forward frames for jet engines.

Since speed in production is as vitally important as speed in flight, this large manufacturer is equipped with AAF ROTO-CLONE Type N Benches. These eliminate the light metal dust nuisance during burring and buffing operations to make better jet parts . . . faster.

Developed originally by AAF engineers for magnesium finishing, this unit or bench type wet-collector has no moving parts, pumps or nozzles, yet maintains the highest efficiency in collecting extreme fines. The Type N ROTO-CLONE removes dust at the source . . . passes entrained material through a sinuous water curtain under heavy turbulence induced by the flow of air through a stationary impeller. Dust is stored as sludge under water within the base of the self-contained unit. This provides complete safety in the case of magnesum or aluminum dust.

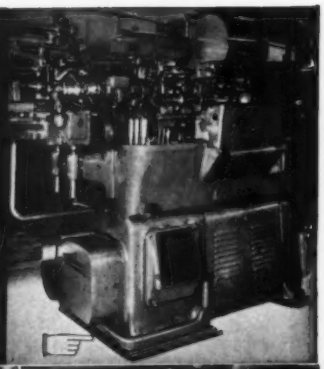
The eleven sizes and three arrangements of the Type N ROTO-CLONE meet requirements for all metal finishing operations such as stand grinding, burring, buffing, sawing, etc. To help speed your metal finishing production call your nearby AAF representative or write for Engineering Bulletin No. 228.

American Air Filter
COMPANY, INC.

228 Central Avenue, Louisville 8, Ky.
American Air Filter of Canada, Ltd., Montreal, P. Q. • Pacific Division Office, San Francisco, California

Telechron

SOLVES Machine Anchoring PROBLEMS



by "Mounting It On UNISORB®"

This leading clock manufacturer cut installation time materially when UNISORB machine mounting came into the picture.

They cut transmitted machine vibration 60% to 85%.

They eliminated the need for old-fashioned, destructive floor-drilling in most instances—*because UNISORB requires no bolts or lag screws.*

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MAIL COUPON FOR FREE BOOKLET TODAY!

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NAME ..... TITLE .....

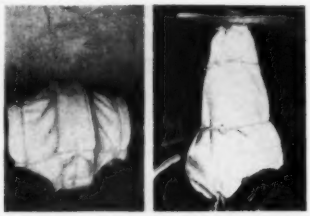
COMPANY NAME .....

STREET .....

CITY ..... STATE .....

plug for connection to a 60-cycle a-c power supply circuit. Transformer taps can be changed to accommodate voltages of 110, 125, 145, 200, 220 and 245. Meter is enclosed in a wood cabinet, weighs 46 lb. An auxiliary chemical assembly, also in a wood cabinet, is available as an accessory. *Research & Control Instruments Div., North American Phillips Co., Inc., 750 S. Fulton Ave., Mount Vernon, N. Y.*

VALVE AND FLANGE COVERS — ChemKovers are designed to provide protection against leakage without hindering normal operation. They're made of Dynel, described as a stable fabric that's highly resistant to acids and



caustics, won't support combustion, and is easily cleaned. ChemKovers are said to have sufficient strength to contain sprays resulting from gasket or packing failures in pressurized lines.

Designed to fit all styles and sizes of valves and flanges ChemKovers are installed without special tools and reported to cost only one-third as much as previous covers. Complete details about them are given in Bulletin CF-27. *Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh 8, Pa.*

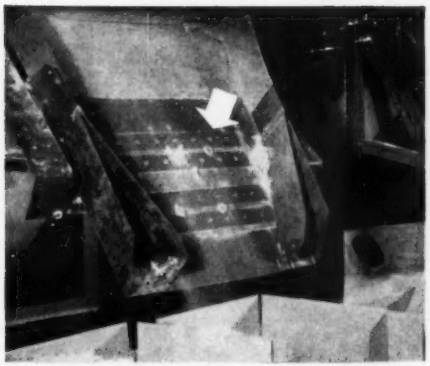
SPUR-GEAR HOIST — Incorporating several design innovations, the new Challenger, now in production in ½- and 1-t capacities, is lightweight and easily moved where needed. The entire unit, including standard length of coil chain for an 8-ft lift, weighs only 39½ lb, company states. Strength and high resistance to shock-load breakage are credited to the use of formed steel plate in the housing, and the back plate is laminated to give extra rigidity for supporting the hoist mechanism. This plate and all other load holding parts are of high-strength steel.

To permit easier servicing, the Challenger is built so it may be disassembled quickly with simple tools. *Coffing Hoist Co., 800 Walter St., Danville, Ill.*

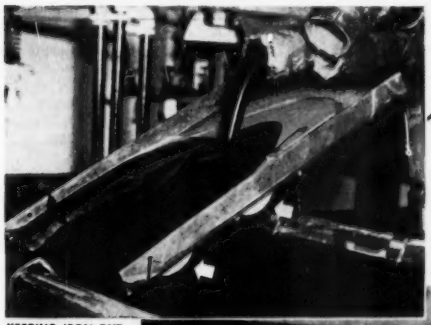
OUTDOOR MOTOR CONTROL UNITS — According to manufacturer these are rain-tight units originally designed for irrigation projects but applicable to many other outdoor motor control jobs. The units consist of a combination across-the-line starter with circuit breaker in an enclosure, with a built-in start-stop pushbutton or hand-off-auto selector switch. The Bonderized sheet steel enclosure is finished in gray enamel.

A self-indicating slamproof handle,

Here are places where the Dings PERMA-PLATE MAGNET can save you money!



SPAGHETTI MAKER SAVES $80.00 PER WEEK with two Dings 4-pole Perma-Plate Magnets to catch tramp iron formerly removed by hand. Magnets also remove iron of abrasion that formerly was not removed.



KEEPING IRON OUT OF CANDY BARS with a Perma-Plate installed in chute to remove fine iron from chocolate in liquid form.

RECORD MAKER PROTECTS DIES AND MOLDS. View shows flow of material over Alnico magnet — note bits of wire.

PREVENTING IRON DAMAGE TO GARNETT ROLLS in a bedding plant with a Dings Perma-Plate Magnet installed above the spiked apron feeder.

IF you would do away with all types of stray iron —nails, nuts, bolts, wire, etc., and its effects, whether it be product contamination . . . damage to machinery . . . or fires and explosions caused by stray iron sparks—CALL FOR THE DINGS PERMA-PLATE. A look at its report card tells why:

NON-ELECTRIC PERMANENT. No power costs, no electrical maintenance or accessories.

POWERFUL, POSITIVE. There are 50 years of magnet design experience behind the Perma-Plate.

MAGNETIC PERMANENCE GUARANTEED. Your assurance of magnetic protection *always.*

HANDLES SOLIDS OR LIQUIDS, HOT OR COLD. Easily installed anywhere, the Perma-Plate is available in 228 different size and strength combinations to provide you with *exactly* the right magnet for the job.

Send for CATALOG C-1205-A

Complete Details on the Perma-Plate including Sizes and Prices. ASK FOR THE PERMA-PLATE CATALOG.

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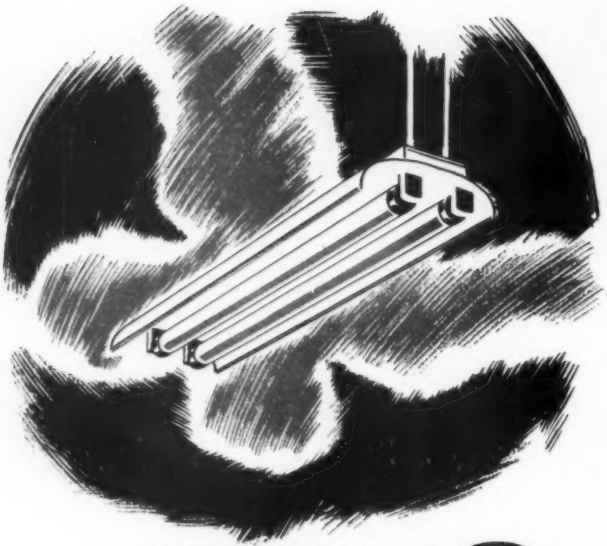
Milwaukee 46, Wis.



BUTTERFLIES IN YOUR LIGHTING SYSTEM?

GET FULL LAMP LIFE
REDUCE REPLACEMENTS
WITH STABILINE AUTOMATIC
VOLTAGE REGULATORS

Surveys have conclusively proved that *good* lighting speeds up production and reduces rejects and accidents. But fluttering "butterfly lighting" caused by variations in line voltage can easily destroy the efficiency of the most carefully engineered lighting systems.

Fortunately there's a simple and economical cure. A STABILINE automatic voltage regulator will take the bugs out of your lighting system quicker than you can say D.D.T. You'll get full efficiency from your lighting and all other electrical equipment plus reduced maintenance and replacement costs.

There's a Stabiline automatic voltage regulator for every power requirement, and it can easily be installed in any existing electrical system. Uncontrolled line voltage may be costing you more in money and trouble than you realize. Why don't you learn the important facts about it today. Send for STABILINE Bulletin S351 today.

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for operating the circuit breaker, has separate positions for on, tripped, reset and open cover, and can be padlocked in the off position.

Starter and breaker are mounted on a steel panel, permitting removal of interior as a unit. Mounting brackets permit surface mounting and there's a 1¼ in. threaded hub at the top for conduit connections. Control relays or control transformer can be supplied. Starters are available in NEMA Sizes 1 through 5; standard voltages are 220 and 440 v—with proper coils starters are suitable for up to 600 v. *Westinghouse Electric Corp., Box 2099, Pittsburgh 30, Pa.*

INTERCOM STAFF STATION—This staff station, incorporating a "privacy" lamp, is designed to let the user answer calls from across the room while enjoying protection from eavesdropping. The user can be 30 ft away from the station, and hear and answer incoming calls without stopping his work to operate the station manually, company points out, and when a master station opens the line to call the staff station a red lamp lights up on the staff station. This indicates that the line is open. *Executone, Inc., 415 Lexington Ave., New York 17, N. Y.*

HIGH HEAT FILTER CLOTH—Outstanding economies in bag house operations where high temperature dust control systems are required are reported through the use of filter bags made from Maco fabric. A development in the research program conducted in Los Angeles County, Cal., in an effort to control smog, this is a silicone-impregnated glass cloth described as having a temperature range up to 550 F.

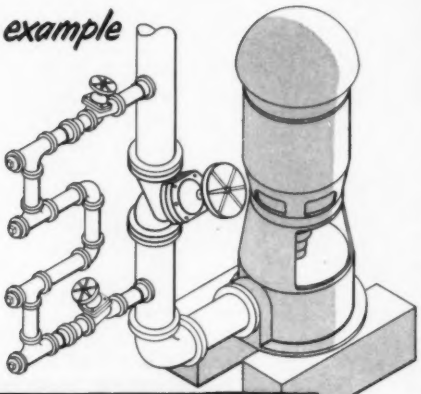
Tests made on this fabric are reported to show 90 per cent effectiveness in the filtration of gases having in excess of 40 per cent submicron particulate. The discovery of Maco is credited with practically doubling the heat range that can be effectively handled by bag filters. Maintenance of the bag house operation is also said to be simplified because the smooth, silk-textured Maco fabric can be cleaned with less shaking. Further information about this silicone-impregnated glass cloth is available from processor. *Menardi and Co., El Segundo, Cal.*

Planning a Paint Job?

PAINTING TOOL—You can apply paint faster, more efficiently and with less effort with the FleetWing Wall Coater, says its manufacturer. The coater, which utilizes a locked-in construction of a specially engineered paint brush bristle (Neoceta), is light in weight, and it offers additional paint carrying facilities and a built-in paint reservoir.

This new instrument is 7-in. wide and consists of two narrow metal channels in which double length strands of bristle are locked. The handle—a little longer than most paint brush handles—is clamped in place and permits an easy, free-swinging stroke for large area

How's This For Solving a Valve Problem ...on Corrosive Well Water, for example



THE INSTALLATION

On outlet of well water pump supplying plant of Barr Rubber Products Co., Sandusky, Ohio. Sulphur content of water extremely high.

VALVE SERVICE RATINGS

SUITABILITY:	Just what was needed
MAINTENANCE COST:	None to date
CORROSION-RESISTANCE:	No evidence of corrosion
SERVICE LIFE:	Outlasted any 2 other valves so far
OPERATING RESULTS:	Pump shutdowns for valve repairs stopped
PRICE:	Much less than alloy valves
AVAILABILITY:	Stock item in Crane line

THE HISTORY

Valves formerly used here lasted no more than 6 months. Under constant exposure to severe erosive and corrosive effects, they failed to provide the easy operation and positive seating needed in this service. They required excessively frequent re-packing and seating maintenance.

Problem solved by replacing with Crane Packless Iron Body Diaphragm valves in main line and by-pass. Installed more than a year, they show no corrosion, no effects of service. Operate smoothly, seat tightly, with no maintenance needed to date.

THE VALVE

Crane No. 1611 Iron Body Packless Diaphragm Valves featuring separate disc and diaphragm. No packing to maintain; no stem leaks. Neoprene diaphragm used to seal bonnet only. Independent disc with neoprene insert insures positive seating even should diaphragm fail. Also fully neoprene lined valves. Many common and corrosive services. See your Crane Catalog or Crane Representative.

The Complete Crane Line Meets All Valve Needs. That's Why,

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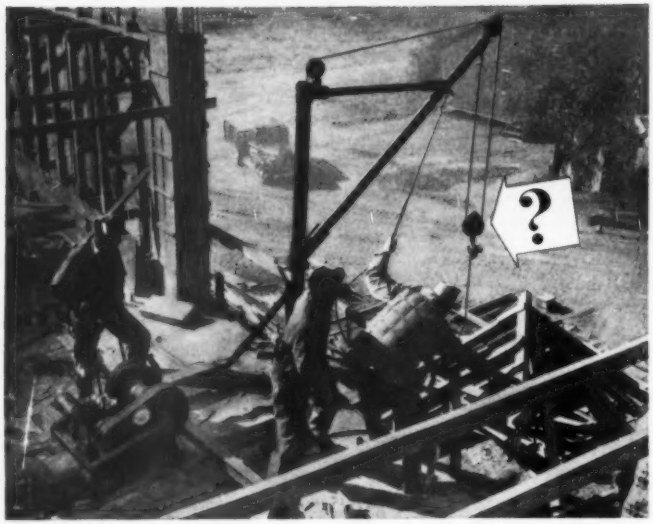
VALVES • FITTINGS • PIPE • PLUMBING • HEATING

What's the capacity of this block?



If you don't know.. don't use it!

Did you realize that today . . . on your own jobs . . . the men *may not know* whether they're using a 2-ton wire rope block to lift a 4-ton load? That perhaps *nobody knows* when a hook might bend, or a pin might shear, and send the load crashing down? To avoid this reckless carelessness, give the order NOW to switch to American CROSBY Wire Rope Blocks. *They have their safe, predetermined capacity* EMBOSSED IN THE SIDE PLATE *for foolproof, lifetime protection.* Built with super-strength throughout . . . extra-thick side plates, oversize pins and axles, heavy stiffening straps, and rugged *drop-forged* hooks. Buy American CROSBY Wire Rope Blocks from your distributor or supply house, in sealed cartons. Made by the makers of genuine Crosby Clips . . . AMERICAN HOIST & DERRICK CO., ST. PAUL 1, MINN.

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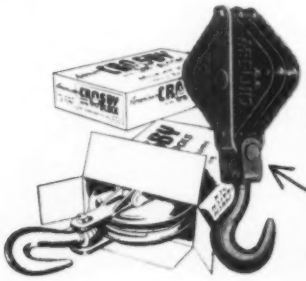


American CROSBY Load-Rated! WIRE ROPE BLOCKS

coverage. At the same time, company points out, the coater is equally efficient for corners, window frames, and hard-to-reach places. It may be used for applying any flat or gloss wall paint including latex, resin emulsion and other water thinned paints. It is described as especially suitable for water thinned paints because the bristle used absorbs little water. The coater will retail for $3.69. More information will be supplied by manufacturer. *Pittsburgh Plate Glass Co., 632 Duquesne Way, Pittsburgh, Pa.*

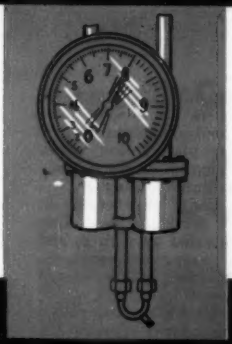
PAINT CAN LIP—A simple attachment consisting of plastic lip and wire handle, the Paint-Boy fits into the top of an open paint can and prevents paint loss and messiness caused by paint dripping down the outside of the can. The lip,

which is wider than the can, drains excess paint back into the can when the brush is wiped against it; and since it also keeps paint out of the rim, it permits a better seal when the can lid is replaced. The handle also serves as a brush rest. Paint-Boys come in a quart-can size retailing for around 45¢ and a gallon-can size, 89¢. Manufacturer will furnish literature. *Norloc Div., Norton Laboratories, Inc., Lockport, N. Y.*

QUICK-DRYING SEALER—Two-coat-a-day wall painting is claimed possible with the new Sealer-Coater, which dries within two hours under normal conditions. This new product has several unusual features, company announces; it applies easily with little drag on the brush and may be used over dry wall construction, wall board, oil type flat wall paints or enamels, resin-emulsion paints and bare plaster (new plaster surfaces require aging first); it doesn't raise fibers in wall boards; it is remarkably free from odor.

It is explained that while this sealer may show lap marks, and is therefore not a finish coat, it provides excellent hold-out for the usual top coats, except rubber base paints.

Sealer-Coater comes in semi-paste form, requires thinning with water for brush application. Company says it goes on so smoothly that a tendency to over-thin should be avoided. Also, it shouldn't be applied to cold surfaces or in a cold atmosphere since these conditions may affect gloss or color of top coat. *E. I. du Pont de Nemours & Co. (Inc.), Wilmington, Del.*



Make BS&B SAFETY HEADS Your Partners in Protection!

Unrestricted PRESSURE RELIEF Instantly!

Pressure relief valves, long a standard for protecting pressure equipment, do a good job in ordinary pressure relief situations. But new products and processes of chemistry have complicated the problem of pressure protection by increasing the incidence of corrosion, gumming, rust, excessive heat and cold, and violent pressure surges. There are times when a valve becomes plugged up or corroded and fails to function properly, or where pressure builds up so fast that its relieving capacity cannot handle the load.

This new situation has caused the accurate, fast-acting BS&B Safety Head to become an indispensable partner for protecting modern pressure systems. When the rupture disc—a controlled zone of weakness—breaks, it leafs out, giving a full-throated, unrestricted opening.

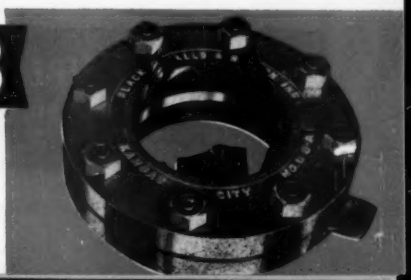
The BS&B Safety Head, a patented pressure relief device, is designed to become an integral part of any pressure system and consists of a preformed metal rupture disc (and a vacuum support, when required) that is held between two specially-machined flanges. The disc is designed to rupture at a predetermined pressure, and is guaranteed, when sold, to rupture within 5%—plus or minus—of its designed pressure at room temperature. By fabricating rupture discs from a wide variety of metals and using protective coatings, Safety Heads can be used with all types of gases or liquids at disc pressures ranging from 5 to 50,000 pounds per square inch.

As a primary relief device, the versatile BS&B Safety Head can be used in series ahead of a relief valve, or at valve outlet.

Solve pressure protection problems by having an experienced BS&B Safety Head Engineer analyze your relief requirements now.

SAFETY BS&B HEADS

Write today for your copy of the BS&B Safety Head Catalog.



BLACK, SIVALLS & BRYSON, INC.
Safety Head Division, Dept. 2-P2
7500 E. 12th Street Kansas City 3, Missouri

Plant Layout

(Continued from page 96)

$1,479,345 for land, buildings, and equipment.

The various arrangements developed by the plant layout engineer in modernizing the layout of the foundry and machine shop under review are shown in Fig. 1. On this plan are shown eight separate construction projects, identified by shaded areas lettered from A at the extreme left to K near the extreme right. These eight projects correspond to similarly lettered layout projects described and evaluated in Table V.

This table shows that the eight projects, A to K in the first column, when grouped in certain ways in the money columns at the right, open up nine possibilities of modernizing this plant before considering the construction of a whole new plant. These nine possibilities are designated as investment plans, numbered from 1 to 9. Plan 1 combines projects A and B. Plan 2 takes in projects A, B, and C. The remaining investment plans continue to add or drop off the rest of the projects.

The investment expenditure starts at $525,635 for plan 1 and varies from plan to plan, attaining a modernization maximum outlay of $1,479,345 previously mentioned in analyzing net profit figures. This outlay is designated as plan 9, and represents the maximum modernization figure reached before considering a new plant.

In the lower part of the same table is given a breakdown of each investment plan by types of capital outlays. That, in a nutshell, is the sum total of all the various capital outlays under consideration for modernizing the old plant. As a final alternative, a total outlay of $3,245,000 is considered in plan 10 to build an entirely new plant in a more advantageous location. Such a step is usually the one of last resort.

1130 Feet-20" Pipe Cleaned IN 4 MINUTES

Seven tons of deposit removed . . . efficiency increased 350%

● This twenty-inch blast furnace gas main in one of the nation's largest steel plants was cleaned in FOUR MINUTES. To do it, the cleaner had to pass through seven 90 degree bends and ten 22½ degree bends.

Patented Pittsburgh equipment pushes valuable "down time" to a low that really saves money. So, for contract cleaning of all types of pipe, in all diameters from ½ inch to 50 feet, that keeps water and waste water systems at highest operating efficiency — LOOK TO PITTSBURGH.

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Distribution Systems

(Continued from page 71)

enough time delay in the transfer means to allow all motor starters except those on very important motors to drop out. The automatic transfer will then quickly re-establish lights and essential service. This has two advantages; the load transferred is less and the inrush current is materially reduced. If there are only a few smaller motors that must be kept on, their inrush current may not be heavy compared with the transformer rating supplying the system.

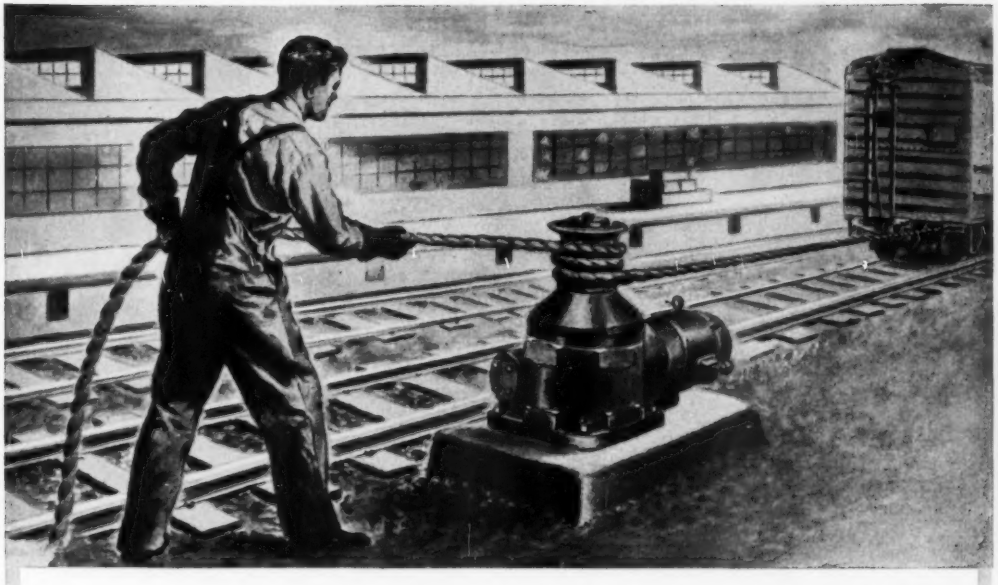
A manual means of transferring for normal maintenance can be used. In this, the tie breaker is closed first and as soon as it closes, the selected main secondary circuit breaker is opened. This does momentarily parallel the transformers and should a heavy feeder fault occur at that instant, the short-circuit current duty would be that of two transformers instead of one.

To transfer when one bus has been de-energized due to a primary system fault requires that the main secondary breaker feeding the de-energized bus be opened manually before the transfer is made. If this breaker were not opened, both secondary buses may be de-energized as soon as the tie circuit breaker is closed because the dead bus would be directly connected to a fault on the primary feeder inasmuch as the main secondary breaker on the dead bus was closed.

Many who read this article will think of other variations of the secondary selective system of distribution which could have been explained here. However, it is felt that those mentioned do cover the greatest majority of variations of secondary selective load center systems now in use.

Speed? Safety? Savings?...You'll get all 3 with a

LO-HED CAR PULLER



IT HAS BEEN PROVED on hundreds of installations. Install a Lo-Hed Car Puller at your railroad siding, and cars will be loaded and unloaded in a lot less time than before. Besides that, with a Lo-Hed to do the job, workmen stop pushing cars by hand and you've eliminated a frequent cause of industrial accidents. And for full measure, a Lo-Hed Car Puller cuts your demurrage costs and puts a complete stop to bills for shifting charges.

The Lo-Hed Car Puller can be just as handy and thrifty *inside* a plant, too. It pulls anything within its capacity that can roll or slide . . . up grades and around corners.

For new efficiency and economy, mail coupon today for the full story about the rugged, electrically-driven Lo-Hed Car Puller.

LO-HED MEANS LOW OVERHEAD

LO-HED HOISTS have many special advantages that bring new speed, ease and economy to materials handling. They're built for longer working life; come in five suspension types; capacities from 500 to 24,000 lbs.

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COMPANY

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AE Products are: Taylor and Perfect Spread Stokers, Marine Deck Auxiliaries, Nein-Shaw and Hydramite Fluid Power, Lo-Hed Hoists, Lo-Hed Car Pullers.

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Gentlemen: Kindly send me full information about
☐ Lo-Hed Car Pullers . . . ☐ Lo-Hed Hoists.

Name_____ Title_____

Company_____

Address_____

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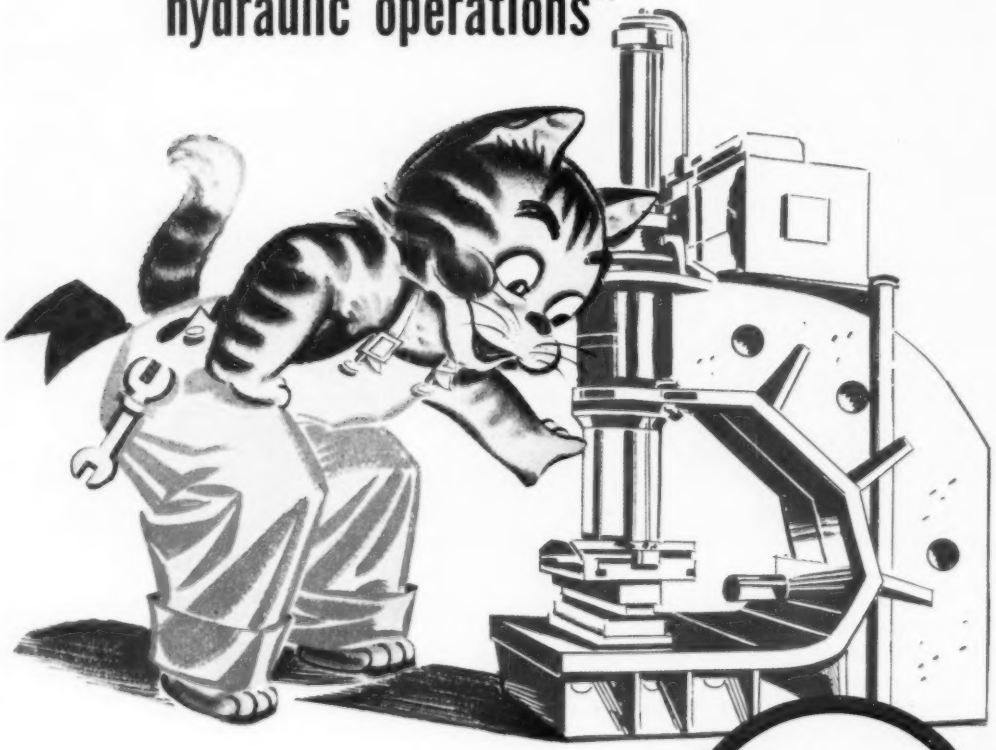
"Tycol Avalon resists corrosion... smooths out hydraulic operations"



It's so! Tycol Avalon Oils make smooth, even hydraulic performance possible, no matter what the temperature. They provide maximum resistance to emulsification . . . permit continuous operation with minimum wear.

Tycol Avalon Oils have reduced hydraulic system costs in hundreds of operations . . . performing superbly and assuring minimum wear of pumps and packings. A selection of grades is available for every use.

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(Continued from page 32)

new portable version of this company's gas cutting machine. Discusses its versatility, accuracy, construction details. Pictures some of the jobs it can do. Also describes controls utilized, includes ordering information on accessories. Air Reduction Sales Co.

143 **Principles of Abrasive Cutting**—An informative 36-pp booklet, Form DE-301, covers principles of abrasive cutting, methods and applications. Company's line of machines is a correlative feature, in that information relative to materials cut, cutting capacities and illustrations of the machines themselves are dispersed throughout text. Campbell Machine Div., American Chain & Cable Co., Inc.

144 **Pipe Tool Book**—Just released is the 1952 edition of company's catalog and data book giving information on pipe and bolt machines, power units, ratchet threaders, reamers and cutters, other power and hand tools. Includes popular "operating guide" section, fully illustrated with easy-to-grasp drawings, and providing other technical copy telling how to locate and correct pipe tools. Beaver Pipe Tools, Inc.

145 **Rotary Work Feed Tables**—Bulletin T-53, 16 pp, illustrates and describes company's rotary work feed tables, providing installation photos and presenting in detail all parts of standard 22 in. and table top and standard 10 in. table top models. Includes dimensional drawings and specifications data, also wiring diagrams and electrical hook-ups to combine these tables with company's other "packaged" pneumatic devices. The Bellows Co.

METALS

146 **Machining Copper Alloys**—Publication E-3, 32 pp, suggests cutting speeds, feeds, tool rakes and clearances to be used on more than 40 different copper alloys. This guide is based on the use of standard cutting tool materials and contains many practical suggestions on turning and cutting-off tools; form tools; drills; reamers and taps; thread chasers; milling cutters and coolants. Also includes tables showing compositions, physical constants and properties of copper, brass, bronze free cutting, general purpose and engineering rods; weight tables and conversion factors. The American Brass Co.

147 **Nickel Alloy Steel Castings** — This 32-pp booklet, containing over 100 illustrations, reports on steel, cast to shape, as a reliable engineering material for meeting service requirements for increased power, higher speeds, heavier loads and longer service life in machinery and equipment parts made in cast form. Data on properties and applications of the nickel steels of the constructional grades are classified by industrial fields. Low temperature properties, abrasion resistance, depth hardening and welding are discussed. Advantages and recommended specifications and compositions for typical service applications given. The International Nickel Co., Inc.

148 **Free Cutting Brass Rods**—Illustrated 24-pp Publication B-16, on copper and copper alloy rods for screw machine use, includes physical constants and properties on 46 free cutting and general purpose rods. Also provides convenient weight tables and conversion factors, plus a ready-reference chart for balancing material costs against production costs. The American Brass Co.

149 **Welding Alloys Directory**—Now available is the 16-pp "1952 Directory" of electrodes and welding alloys. Contains photos, data and technical information on a series of "Eutectic Low Temperature Welding Alloys" for use on cast iron, steel, alloy steels, copper, brass, bronzes, aluminum, magnesium, hard and machinable overlays and for cutting all metals. Other pages are devoted to a chart of 109 welding alloys, their main uses, bonding temperatures and tensile strengths, ideas on effective use of welding. Eutectic Welding Alloys Corp.

PUMPS, COMPRESSORS

150 **Elevator Pumps**—Specifications and construction features of three models of hydraulic elevator pumps are presented in illustrated Bulletin 20, 6 pp. Gears, bearings, relief valve, and venturi suction and discharge principle discussed in detail, as are fundamentals of efficient operation. Includes installation tips, mounting layout. Geo. D. Roper Corp.

151 **Proportioning Pump**—A high pressure, low capacity reciprocating plunger pump for use where a controlled capacity of fluid is required is featured in this illustrated bulletin. Also describes a chemical feed packaged unit utilizing this pump. Specifications provided, as well as an application chart covering simplex and duplex models of the Barco pump. The Bird-Archer Co.

152 **Centrifugal Pumps**—Twelve-pp Bulletin 715-1 presents manufacturer's support-head type centrifugal pumps, describing and illustrating construction details and providing performance data, specifications and dimensions. These are single stage, ball bearing, enclosed impeller pumps for direct drive or belt drive; for general industrial use, water supply systems, booster service, air conditioning. Goulds Pumps, Inc.

153 **Rotary Compressors**—Bulletin C-1 is company's most recent on rotary compressors. Fully illustrated, provides sketches of intake regulator, and bearing and ring assemblies, also photos of installations. Explains principle of operation. Fuller Co.

SAFETY, FIRE PREVENTION

154 **On Ladder Safety**—This folder illustrates improved safety features of company's Dural aluminum straight and extension ladders. Details of run construction, siderails, locks and shoes which contribute to safety, durability, strength and ease of handling are shown and explained; sizes listed. Duralumium Manufacturing Co.

155 **Extinguishers and How to Use Them**—A good refresher course on modern fire-fighting devices and the different fire extinguishing agents used in them is contained in "Correct Fire Protection," a 32-pp illustrated booklet. Illustrates and describes various sizes of units available for use with different kinds of extinguishing agents. American-LaFrance-Foamite Corp.

156 **Fire Fighting Products**—Illustrated Portable Catalog CF-7 presents company's line of fire fighting equipment and chemicals. A variety of hosette types are pictured and described, also applicators, pipe, ball valves, adaptors, related equipment. An around-the-pump proportioner and liquid foam and wetting agents are also covered. Rockwood Sprinkler Co.

COOLING, VENTILATING, AIR CONDITIONING

157 **Cooling Coil Developments**—Latest developments in extended surface cooling coils, for use with direct expansion refrigerants and chilled water in air conditioning or process applications, are summarized in 72-pp revised Bulletin DE-360. Included in descriptive material are a new coil, Type S, for use where the quantity of water is restricted, and a redesigned coil, Type OS, that can be drained where danger of freezing exists. Special consideration is given coils designed for gas cooling, butane vaporizing, transformer oil cooling, generator cooling and condensing of gaseous refrigerants. Booklet provides performance data tables, selection instruction, specifications to enable selection of proper design for any air conditioning, industrial or process application. The Trane Co.

158 **Cooling Towers Noisy?**—Bulletin C-2 describes and illustrates silencing equipment for cooling towers. Lists causes of noise, paths of noise transmission, methods of noise elimination. Pictures silencers in use. Industrial Acoustics Co., Inc.

159 **Controlled Ventilation** — Bulletin DV-31-51 contains illustrations, construction details, capacity ratings and dimensions on company's Panel Vent sets for use at free delivery or relatively low static pressure. Units described have fan wheels of 24-, 30- and 36-in. dia. air moving capacities to 13,100 cfm. DeBothezat Fans Div., American Machine & Metals, Inc.

160 **Fans and Blowers** — This 12-pp pocket-size catalog lists a wide range of ventilating fans, air circulators, belt driven exhaust fans, floor and window fans, also spray booth fans, pressure and volume blowers in 4 capacities for most industrial applications. Illustrated, includes specifications, prices. Standard Electric Mfg. Co.

161 **Heat Transfer Data** — Twelve-pp Bulletin PE-2 contains a series of charts and nomographs which greatly simplify calculation of heat transfer requirements. Data are also given for a newly designed cascade type heat exchanger—coolers available in standard complete units to meet various requirements. Utilizing specially constructed Pyrex glass heat exchange tubes, these coolers provide an economical means of cooling corrosive liquids. Corning Glass Works.

PRODUCTION CONTROL, RECORDS

162 **Production Control Systems, Procedures**—Publication K-1268, 16 pp, details a method of materials control intended to result in a shorter planning cycle while speeding production by eliminating causes of delay on the production line. Illustrated with typical forms and charts, book outlines procedures for engineering, production planning and progress, machine load, material and tool procurement and control. Includes case history of an installation. Remington Rand Inc.

163 **For Low Cost Copying** — Booklet A-3089 illustrates the Model 20 Copyflex

February, 1952

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PLANT ENGINEERING

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for making copies of engineering drawings and other forms. Discusses cleanliness, ease of operation of the Model 20, which uses no vapor developer, negatives or stencils. Gives specifications. Charles Bruning Co., Inc.

164 **Need a Punched Card Machine?** — "Everything to Gain . . . Nothing to Lose" (Bulletin TM 737.1), is a 6-pp folder describing company's "use-purchase plan" for punched-card accounting machines. Tells how plants can gain benefits from use-purchase of tabulating equipment through equity in the equipment, savings between monthly payments and monthly rentals, and price stabilization assuring fixed payments over a long period of months. Remington Rand Inc.

165 **Machine of Many Jobs** — Extra savings for punched-card users are detailed in 12-pp Form TM 562. Explains in chart form how use of company's Interfiling Reproducing Punch can speed and simplify records and reports. A cutaway illustration shows what goes on inside this punched-card accounting machine, text explains operating features, tells how machine compares, punches, segregates and files, handling 100 to 200 cards per minute. Discusses application of punched cards to production control, other plant functions. Remington Rand Inc.

LIGHTING, COMMUNICATION

166 **White Light Source**—Compact, detailed information on company's JH-1 fluorescent mercury lamps is available in Booklet A-8007. In addition to describing the lamp which produces "golden white" light, the booklet provides recommendations as to where it is best applied. Comparisons with light from other lamp sources and tables of technical and transformer data are also given. New luminaires, designed specifically for the JH-1 and their diagrams are presented along with their distributions and coefficients of utilization. Lamp Div., Westinghouse Electric Corp.

167 **Sound Systems**—The simplification of plant administration, improved human relations, instant communication and other benefits of a modern sound system are stressed in 12-pp Form IR1302. Shows some of the jobs such a system can perform, pictures equipment utilized, diagrams a typical installation. Discusses flexibility of systems in meeting industrial plant problems. Sound Equipment Section, Radio Corp. of America.

MECHANICAL POWER TRANSMISSION

168 **Hydraulic Cylinders**—Section 2, Catalog 260, 22 pp, presents complete data relative to manufacturer's most recent engineering developments in rotating type and non-rotating hydraulic cylinders, the latter offering a wide range of mountings. Fully illustrated, provides application suggestions, sizes. Logansport Machine Co.

169 **Improved Tension Control** — In Bulletin 163, manufacturer's Hydro-Wynd is described as a modern winding device affording constant tension and speed without constant adjustment. Cutaway drawing in color illustrates explanation of how Hydro-Wynd works. Photos of installations included, also a typical layout plan. Twin Disc Clutch Co.

170 **Modern Drive Units**—Again available to plant engineers is 16-pp Bulletin 2102 giving engineering data on company's steel Motoreducer. Filled with selection tables, dimensions, weights, booklet pictures horizontal and vertical all-motor types, as well as horizontal integral units and integral models built for vertical shaft operation. Stresses improved design features of the units. Load classification tables provided cover use of these units for driving a wide range of machines, conveyors, cranes, elevators, pumps, processing equipment. Data on flexible couplings too. The Falk Corp.

171 **FHP V-Belts** — Improved single-groove V-belts featuring straight sidewalls for more grip, and cords in the strength member held in a straight "power line" to increase life of belt and driven machine by eliminating vibration, are described in Bulletin 6830 B, a small folder. Standardized belt numbers and list of standard sizes included. Manhattan Rubber Div., Raybestos-Manhattan, Inc.

LUBRICATION

172 **Modern Machine Lubrication**—Bulletin MB-7 features an illustrated description of the lubrication of a giant plastic injection molding machine by means of hydraulically operated built-in lubricators. Also describes a punch-press oil system, and a small capacity lubricator for packaging machines. Bijur Lubricating Corp.

173 **Turbine Oil Conditioning**—Bulletin 532-P, 12 pp, offers a detailed explanation of the reasons for turbine oil conditioning, the way in which company's dry type conditioning equipment nullifies or prevents factors which promote deterioration of oil, and the question of system efficiency as affected by circulation rate and system capacity. Fully illustrated, tells how system works, describes equipment, some typical methods of installation. Includes dimensions. Bowser, Inc.

FLOOR MACHINES

174 **Mechanical Sweepers**—Here's a folder describing Plantman low cost mechanical floor sweepers for industrial use. Stresses economy, efficiency, ease of handling of these sweepers. Lists many prominent users. Handling Devices Co., Inc.

175 **Floor Scarifier** — Bulletin 23.4 describes and pictures a new hydraulically equipped machine designed for removal of traffic-packed grime from trucking aisles in industrial plants. Explains how it cuts, picks up grime in one operation; is one-man operated. Gives specifications for machine which is powered by a 25 hp Wisconsin engine, has hydraulic brush controls. G. H. Tennant Co.

OTHER EQUIPMENT

176 **Heating Coils**—A complete line of steam and hot water coils for a wide range of applications, in both standard and non-freeze types, is described in the 56-pp new edition of Bulletin DS-385. Outlines capacities, selection, performance, installation and dimensional data on all of company's coils. Standard types have a solderless bond, formed by mechanical expansion of seamless copper tubing into aluminum fin plate fins, a design said to contribute to high heat transfer and durability. Many installation photos included. The Trane Co.

177 **Boiler Settings**—Excellent reference material on boiler operation and maintenance is provided in 24-pp "Boiler Settings with Plastic and Castable Refractories." Contains numerous cross-sectional drawings, charts, technical illustrations and other data in the field of plastic and castable refractories and their applications. Also presents information about refractory manufacture, design and installation. The Ramtite Co.

178 **Continuous Weighing Feeder**—Bulletin 25-FSB describes company's Belt Gravimetric feeder for continuous weighing and feeding of dry materials at capacities from 100 to 100,000 lb per hour. Lists features of the feeder, describes operation of major parts, illustrates mechanism. Omega Machine Co.

179 **What Is X-Ray Diffraction?** — The purpose of this little booklet is to show industrial uses of this type of equipment for problems involving plastics, paints, cements, food products, pharmaceuticals, soaps, metals, rubber, chemicals, glass, petroleum. Tells how this non-destructive analysis method identifies components or raw materials, unknown materials, constituents of mixtures, impurities. Also covers use in selection of raw materials for production analysis and control. Research & Control Instruments Div., North American Phillips Co., Inc.

180 **Good Place for Wraps**—Manufacturer's Lockerettes, modern scientific locker units combining best features of both lockers and coat racks, are described and pictured in Bulletin 2048. Lists advantages; gives sizes, colors. Vogel-Peterson Co.

181 **Switching Engines**—Of interest to plant engineers concerned with switching locomotives are these new publications. Bulletin GEA-5208 describes in detail the Alco-GE six-motor 1600-hp road switcher, a heavy-duty all purpose locomotive. Bulletin GEA-5452, 6 pp, on armature and field coils, covers coils for transportation equipment, including traction motors, generators, motor generators, auxiliary generators, blowers, amplidynes. Ask for either bulletin or both. General Electric Co.

182 **Underdrive Presses**—This recent 12-pp catalog, presenting a line of single, double and triple action underdrive presses, is described as the first publication on this type of press. Principal feature of company's underdrive units is placement of clutch, brake and other major drive components on a level below the actual working area; maintenance and service functions are performed on a sub-floor level. Illustrations, detailed specification data and explanation of operating features provided. Danly Machine Specialties, Inc.

183 **Spray Nozzles**—Up-to-date information on non-clogging spray nozzles for cleaning all kinds of materials, screens, fruits, vegetables, etc., is given in illustrated Folder 2383. Shows installation pictures and how simply nozzle can be applied. Tables give dimensions for pipes of 1 to 3 in. dia, also rpm capacities at pressures of 20 to 100 psi. Link-Belt Co.

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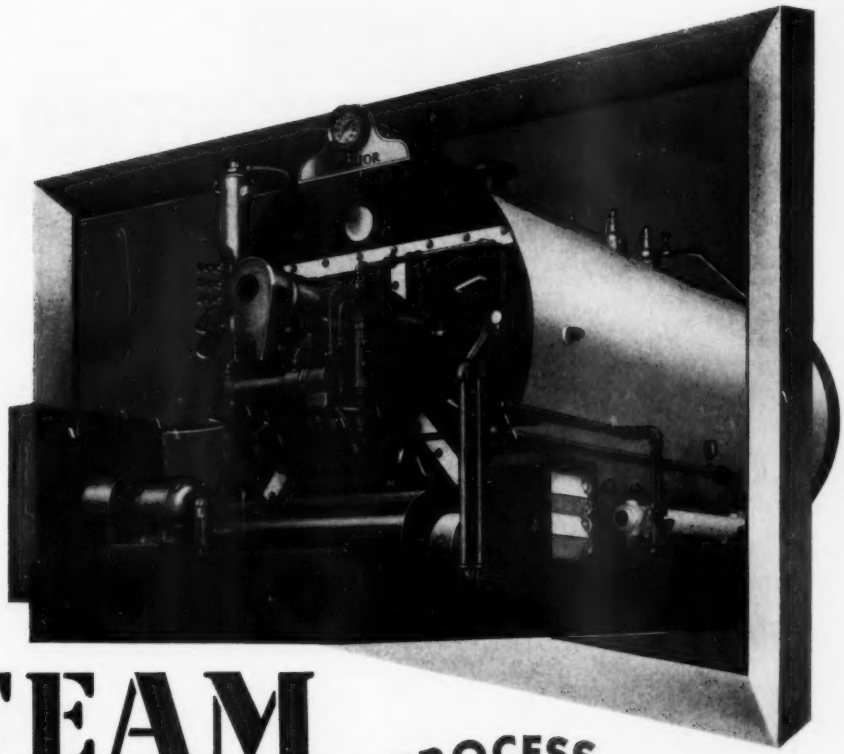

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To help yourself get the metals *you* need, talk to your dealer or other regular outlet about prompt disposition of your scrap.

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Controls at Timken

(Continued from page 83)

some installations have automatic controls which automatically shut off all combustion fuel in the event of power failure, fan failure, low gas pressure, or excess temperatures. This safety control is entirely separate from the operating control equipment, and will function independently from the operating controls. This, therefore, insures adequate protection of personnel and equipment.

The preceding is not a complete coverage of all control equipment nor a detailed description of those discussed. However, some idea of the applications and the dependence placed on these applications can be appreciated. As previously stated, the quality of the product is maintained and assured by the use of control and indicating instrumentation, for which reason such installations are constantly on the increase in all of the plants of The Timken Roller Bearing Company.

Microfilming

(Continued from page 73)

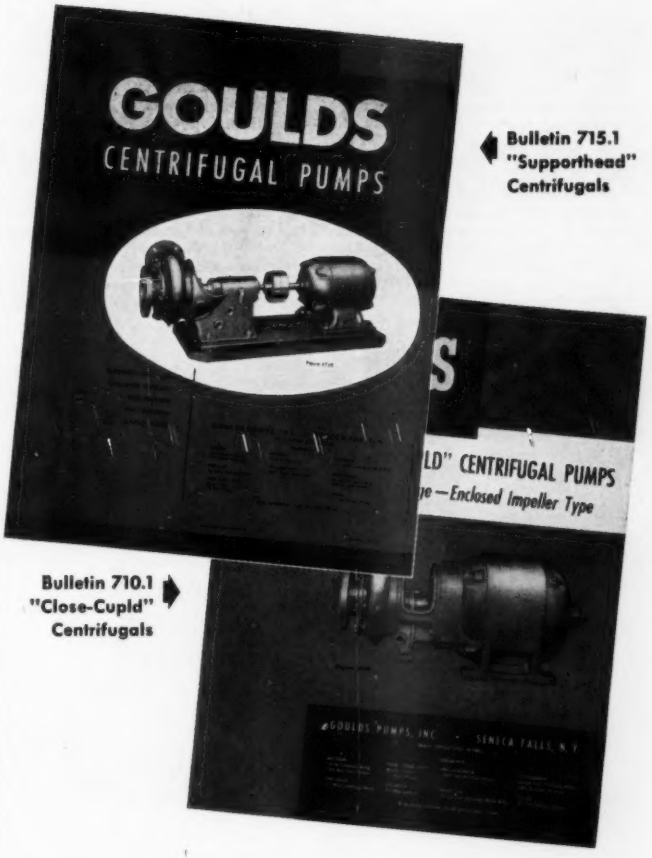
to 42 in. wide. Most rotary cameras will place faces and backs of small sheets side by side on the film. Filming rates may run as high as 500 check-size records a minute.

The flat-bed camera, though slower through use of the hand feed, produces the sharpest image possible on the film. In the better-known makes the film is held by vacuum in the focal plane during exposure. Copy up to 37 by 52 in. in size can be handled, and larger drawings in sections. Fronts and backs of sheets to letter size may be placed side by side on the film. This type of camera alone can handle bound volumes. Filming rates run from 15,000 pages per day downward.

Operation of either type of camera can be handled by personnel in the lower labor grades; the skill has been built into the machine. However, the setup for a new type of job is always a critical one, and requires the services of a skilled technician.

Processing of the exposed film must be carefully controlled for proper density and contrast, and the film should be checked after processing for chemical stability if the records are to be considered permanent. Processing equipment, exclusive of darkrooms, plumbing and electrical installations, ranges from $200 to $20,000. Contact printers for film duplicates cost about $1,700, and enlargers for paper facsimilies run from $200 on up.

Reading equipment is basically the incorporation of projector principles in an integral unit where the beam of projected light is folded to bring



These new bulletins make it easier for you to select the right pump

These new bulletins have been designed to help you. New sizes are listed, and, in each bulletin we have put a composite rating chart which includes both "Close-Cupld" and the supporthead. This makes it dead simple to put your finger on the right pump for your requirements.

Another valuable feature of these bulletins is the parts chart. Using this you see exactly what parts are interchangeable for all size pumps and so can keep your spare parts investment to a minimum.

Use the coupon below to send for these useful FREE bulletins *today*. Goulds Pumps, Inc., Seneca Falls, N. Y.

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the enlarged image to an area convenient for the operator (who simultaneously is manipulating the film in advance or the film-carrying card). Readers fall into one of two groups: the opaque screen, and the translucent screen. Selection of the type of screen is a matter of personal preference. Readers cost from $150 to $750.

Microfilm storage cabinets, with provision for limited control of humidity where the temperature range is not excessive, sell for about $200 to $325, and hold from 60 to 900 rolls of 16 or 35mm film (40,000 to 18,000,000 documents).

Whether or not it is economical for the prospective user of microfilm to buy or rent the equipment, or to secure the contract services of a microfilming company, is determined by the quantity and frequency of the filming operation. Where a plant adds only 5,000 drawings a year, it is obviously uneconomical for a $2200 camera to sit idle all but one week of the year: the employer loses not only in equipment depreciation, but in loss of facility in the operator.

Even figures given for the installation cited in the section on Low Cost Duplication—making 175,000 exposures per year—indicate that it would be cheaper for this plant to have a microfilm contractor come in periodically for pick-ups. In the use of rotary cameras for microfilming current office records, many companies own or lease their cameras, and use the services of a microfilming contractor only for duplicating extensive back files.

Central Systems

(Continued from page 78)

lower piping and wiring costs, where, then, may the installation of compressors outside the central system be justified: There are numerous situations calling for compressors to be installed outside the central system, some of which are:

1. Air Needed at Remote Spot—A large plant may require a volume of compressed air at some point remote from the nearest connection to the plant air system. To lay new air lines connecting into the central system might easily cost several times the price of a complete new compressor installation large enough to supply the remote demand. Obviously, a separate compressor installation is warranted. Furthermore, the addition of the remote load might actually overload the main air system.

2. Off-Standard Pressure—A separate compressor is certainly justified where localized requirement exists for air at higher than plant pressure. An individual compressor installation located as close to point of use as practicable is the only sensible solution to such a problem. If the volume of the air demand is substantial, a booster compressor, taking plant air at the suction side of the booster, will save cost, power and floor space.

3. Temporary Air Demand may exist, particularly in this defense era. Rather than add to the main air system with a larger-than-needed compressor, one or more small compressors of the vertical or angle type can be installed quickly without special foundation at minimum cost and with prospect of salvage value when the need ceases.

4. Special Service — Compressors supplying air for boiler controls or other vital operations requiring only a small volume of air are often (and wisely) installed. They are independent of the main air system, permitting the latter to come to rest.

Because a compressor is merely a converter of one form of power to another form of power, this conversion must be accomplished with minimum capital outlay and minimum losses if a truly efficient operation is to result. The best assurance for meeting these conditions for the average plant is the use of equipment with the lowest initial cost per unit of capacity and the highest efficiency. The central compressed air system meets both these requirements.

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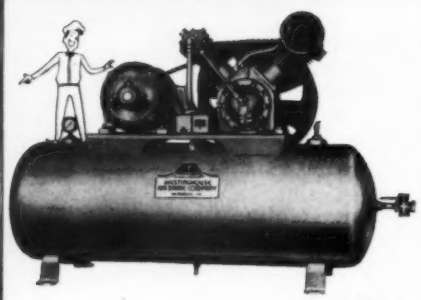
that's why the Westinghouse "Y" saves money for you!



With most machines, *no oil* means a repair job. When someone forgets to lubricate, the oil-starved unit runs itself right into the repair shop.

With the Westinghouse "Y" Compressor, it's a different and happier story. The "Y" gives you warning when the oil level is too low; it refuses to pump air. If the level drops during operation, the "Y" unloads. This S.O.S. lets you supply oil before scoring, seizing or other damage occurs.

This exclusive "No Oil—No Air" protection has saved countless repair bills for users . . . and it's only one of a parade of modern features you get in the Westinghouse "Y". Thermal overload protection—Starting Unloader . . . automatic pressure control . . . automotive-type pressure lubrication . . . multiple V-belt drive. Every one helps to give you a more dependable, economical air supply. And that's a big consideration *today*—that no one can afford to overlook!

Only the Westinghouse "Y" gives you ALL THREE

Low Oil Level Protection—No Oil—No Air, bans wear and repair.

Thermal Overload Protection—Standard, at no extra cost, on the "Y".

Starting Unloader—Compressor remains unloaded till speed and oil flow are normal.

Westinghouse "Y" capacities range from 6.2 to 68 cfm displacements . . . motor HP from 1½ to 15. Gas engine drive also available. Horizontal or vertical tanks.

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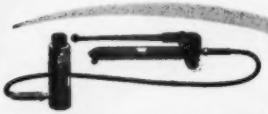

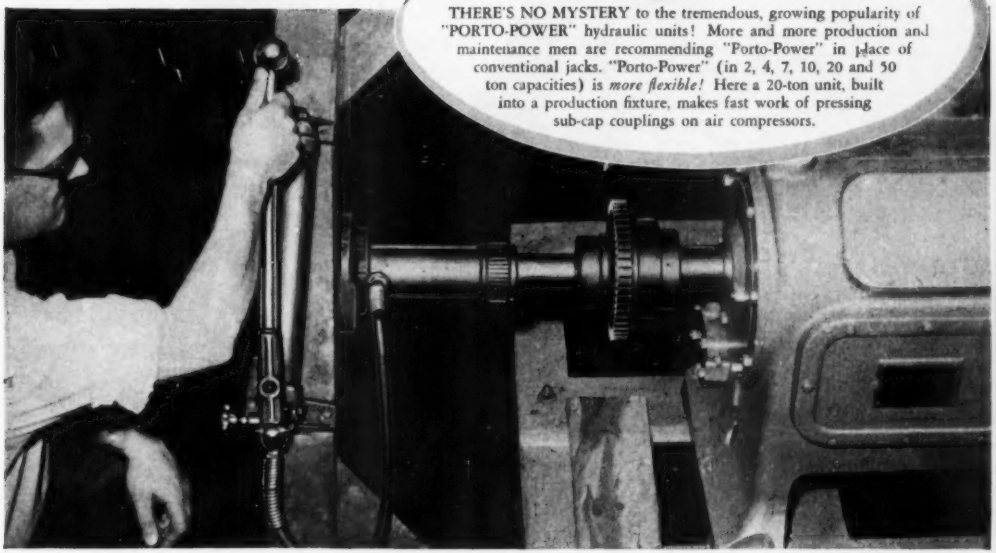

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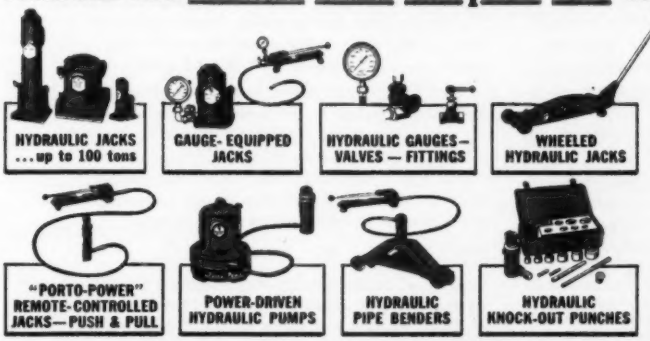

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POUNDS OF STEEL PER PERSON PRODUCED IN 1950 UNDER U.S. COMPETITIVE SYSTEM BY OUR 253 STEEL COMPANIES
REST OF WORLD
97
POUNDS OF STEEL PER PERSON

FORTY YEARS AGO the automobile was a rich man's toy. TV and radio were unheard of. Refrigeration? You hung a card in the front window to signal the ice man.

Today we drive 40 million cars, listen to 90 million radios, keep food in 33 million refrigerators.

Yet millions in the rest of the world are still groping in the primitive darkness of 40 years ago.

Why have we moved ahead? Competition is a chief reason. Only competition in business has made luxuries commonplace in your home today. Competition, for example, in the production and sale of steel and things made out of steel.

Steel makes progress possible—in war or peace . . . in the manufacture of everything from tableware to tanks, razor blades to skyscrapers, baby carriages to "Big Mo".

How well does this competition of ours work in the steel business?

. . . The U.S.A. shows an 83.4% gain in steel output between 1939 and 1950. The rest of the world shows an 0.8% loss.

. . . In 1939, the U.S.A. under "competition" made ⅓ of all the world's steel. Today we produce half—all with only 6% of the people in the world.

. . . Steel workers under "competition" gained in jobs, too. There were 449 thousand jobs in 1939. Today—637 thousand.

The steel industry is just one example of how a free competitive system works. Ours is the security millions of people in the world dream of when they embrace such dead-ends as "planned economies".

Look around and see what happens when people hand their jobs and factories over to the government. Or have them taken by law. Or by force. Name it what you will—"communism", "nationalization", "socialism", "regimentation"—it is a one-way street, and no turning back. By then people no longer own government. Government owns the people.

• • •

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NEW BOOKS

for the plant engineer

Galvanizing Practice and Theory

GALVANIZING (HOT-DIP), by Heinz Bablik. Third edition; size 5¼ by 8 in.; 502 pp; illustrated; cloth bound. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price $10.00.

THIS SURVEY of hot-dip galvanizing is the work of an owner-manager of his own galvanizing plant. The book covers the structure and composition of the scale that occurs as a result of surface oxidation. It also presents the pickling theory and practice for scale removal. Attention is given to the use and nature of fluxes but the major portion of the book is devoted to galvanizing theory and practice.

Small Plant Boiler Feed Water Treatment

BOILER FEED WATER TREATMENT by F. J. Matthews. Third Edition; 5⅜ by 8½ in.; 207 pp including appendix and index; illustrated; cloth bound. Published by the Chemical Publishing Co., Inc., 212 Fifth Ave., New York 10, N.Y. Price $4.50.

THIS GUIDE on boiler feed water treatment is particularly applicable to problems in small plants. The text of this edition has been revised and rewritten to include new plant constructional features and also to meet new developments associated with the treatment of feed water. New matter has been included on silicate scale, hydrogen and demineralizing zeolites, prevention of turbine deposits and others.

The book is presented in five sections under the following headings: natural water supplies, scale formation, corrosion, foaming and priming, and analysis and routine testing. Standard solutions, reagents, Clark's table of hardness, chemical factors, conversion tables, and a summary of recommended practice are included in a short appendix.

Furnace Technology

INDUSTRIAL FURNACES by W. Trinks. Fourth edition; size 6 by 9 in.; 526 pp including index; cloth bound. Published by John Wiley and Sons Inc., 440 Fourth Ave., New York 16, N. Y. Price $10.00.

THIS GUIDE on industrial furnace practice contains many changes and improvements over previous editions. Revisions tend to keep de-

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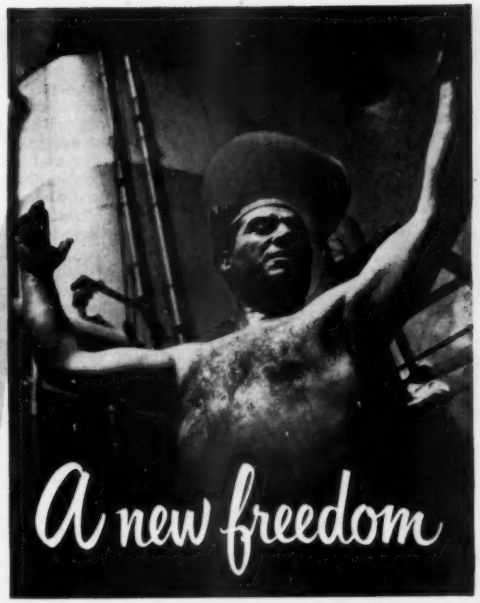

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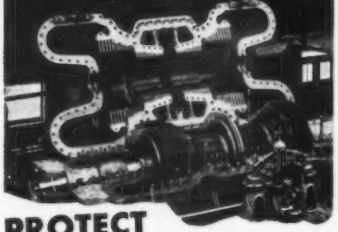

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Theory and Performance Of Synchronous Machines

SYNCHRONOUS MACHINES, Theory and Performance, by Charles Concordia. First edition; size 6 by 9 in.; 224 pp; illustrated; cloth bound. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price $5.50.

THIS BOOK IS intended primarily for the engineer who wants to know about the transient performance of synchronous machines with regard to the calculation of transient short-circuit currents and torques; steady-state power, torque, and current, both in synchronous operation and during starting; and the voltage disturbances caused by the sudden application of load.

Use of the general equations developed in this book will allow the engineer to predict machine performance under these conditions. Emphasis is placed on the mathematical development and a fundamental physical understanding of the machine so that the engineer can extend the theory as he needs it.

Trends in Industrial Architecture

INDUSTRIAL BUILDINGS compiled by K. Reid, Size 8½ by 11½ in.; 566 pp including index; illustrated; cloth bound. Published by F. W. Dodge Corp., 119 West 40th St., New York 18, N. Y. Price $9.00.

THIS WELL-ILLUSTRATED survey includes all the informative material on industrial buildings which appeared in the "Architectural Record" during the years 1940 to 1949. The bulk of the material deals with industrial buildings for peaceful purposes.

Articles by leading architects discuss technical matters of lighting, heating and ventilating, plumbing, construction, and plant layout.

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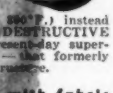

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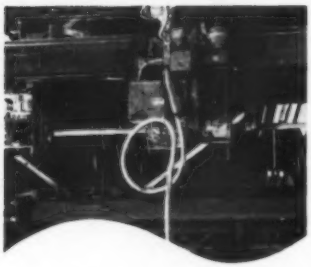

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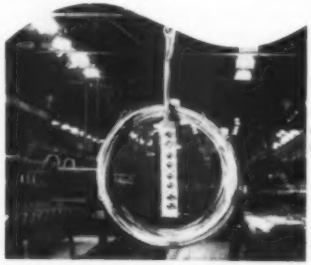

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DATA FILE

of literature for the plant library

STANDARD CATALOGS, bulletins and handbooks are listed to aid plant engineers in maintaining a permanent, up-to-date data file. For copies of these, write the number preceding the desired bulletin on the card in the heavy insert, pages 37-38 and 135-136.

ELECTRICAL

201 Motor Control—A handy reference book on modern motor controls, comprises 76 pp of condensed information, dimensions and prices of the most popular items in company's line. Covers a-c manual and magnetic across-the-line switches; a-c voltage starters, control relays and contractors; synchronous and high voltage starters; d-c control relays, contactors, starters; drum switches, a-c d-c rheostats, speed regulators; push buttons, limit switches, and accessories. Allen-Bradley Co.

202 Motor Handbook—Bulletin MU-185 provides 66 pp of engineering and descriptive data on motors, covering splash-proof and explosion-proof types, gear motors, motors for use in chemical plants, for oil well pumping, punch presses, elevators, cranes and hoists. Wagner Electric Corp.

203 Power Distribution Feeders — Catalog TEB-1, 40 pp, on heavy-duty units for main feeders in distribution system, gives construction, engineering, application data. The Trumbull Electric Mfg. Co.

204 Precision Switches—Twenty-pp Catalog 81 covers industrial switches for a-c circuits. Describes general purpose basic switches, auxiliary actuators, enclosed, explosion-proof and splash-proof types, limit switches, small switches. Includes technical data, prices. Micro Switch.

205 Bus Duct Manual—Booklet B-4272A, 68 pp, on bus duct and accessories, presents application and test data, specifications, information on pricing a typical installation. Describes advantages of bus duct for a secondary power distribution system, carrying current from transformers to switchgear—and from there to motors, lighting systems, etc. Tells where bus duct can be used to advantage. Company's line of bus duct is shown and dimensions given. Westinghouse Electric Corp.

206 Small Bus Duct—Detailed information on a midget-size bus duct is contained in Bulletin 703. Illustrates entire unit, also strap and hanger. Text discusses major parts, design features. Includes list prices. Frank Adam Electric Co.

207 Electronic Tubes — Here's a 28-pp catalog furnishing complete technical specifications and other information on tubes for control, processing, production, research, testing, counting, sorting, weighing, measuring, detecting and many other applications. Features nationally-known brands. Milo Radio and Electronics Corp.

208 Distribution Duct Engineering Data —Bulletin 427-4 contains 32 pp of data for estimating ventilated duct for feeder circuits, plug-in duct, and plug-in duct for branch circuits. Includes instructions for laying out distribution duct jobs, and pointers on estimating, diagrams, layout symbols. BullDog Electric Products Co.

209 Buyers' Manual on Motors and Control—Fifty-pp Catalog GEC-1009 presents buying information on a carefully selected group of motors, motor starters, control accessories and electronic control. Ratings listed are those most frequently required. Excellent selection data, dimensions, ratings and prices. General Electric Co.

210 Plug-In Power — Sixty-pp Catalog 25 offers real help on electrical installation problems involving portable tools, ma-

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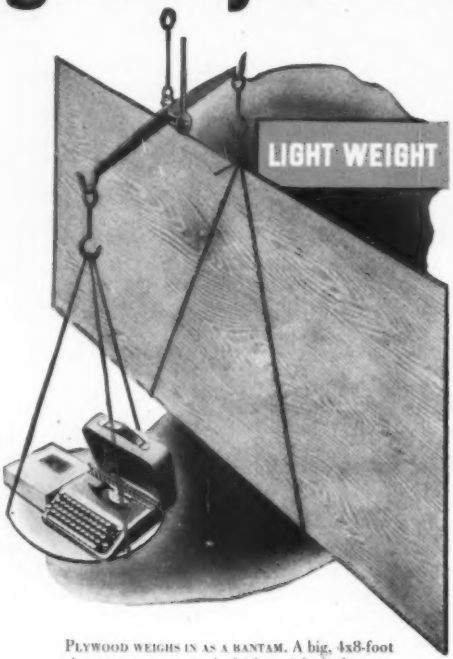

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terials handling equipment, cranes, hoists, cutting equipment. Covers a prefabricated trolley busway electrical distribution system to provide outlets for power or light where needed. Feedrail Corp.

211 Weatherized Motors—Six-pp Bulletin 400 describes company's All-Weather integral motors for industrial use. These have full height protection, through ventilation, one-piece steel shell, interchangeability of end head. Robbins & Myers, Inc.

213 Power and Control Cables—Sixty-pp Catalog 24 describes typical power and control cable designs and is intended as a guide in selecting proper wire and cable type. Describes insulations, sheaths and coverings, electrostatic shielding, and includes product data on all types listed. Gives standard reel sizes and capacities, standard specifications. Rome Cable Corp.

214 Battery Technology Handbook—This is a 56-pp revised edition of company's manual of technical instruction and engineering data on the care of motive power storage batteries. Major addition is a section on charging, which includes information on modified constant voltage and two-rate charging, boost, equalizing and emerging charging, control of discharge, etc. Other sections cover the theory of the lead-acid battery; practical tips on care and operation; maintenance and repair. Gould-National Batteries, Inc.

LIGHTING

216 Industrial Lighting at Work—Sixteen pp Booklet B-4727 stresses three ways of putting better lighting to work: cutting costs by promoting more production; increasing efficiency by ensuring accuracy, and reducing accidents by exposing dangerous operations. Analyzes mercury vapor and incandescent light sources as to efficiency, service life, maintenance, mounting height and job suitability. Luminaires of each type are pictured; wattage and lumen output ratings. Westinghouse Electric Co.

217 Recommended Lighting Systems—This 16-pp article describes six lighting systems adaptable to most industrial plants. They include systems for illumination levels of 20 to 40 ft-c, for levels of 40 to 60 ft-c and for levels of 60 to 100 ft-c, and involve use of filament, fluorescent, and mercury lighting and combinations of these. Explains lighting classifications, and discusses advantages of each type of lighting. Also discusses supplementary lighting. Lamp Dept., General Electric Co.

218 Plant Lighting Planning Guide—This 32-pp handbook of industrial lighting presents economics of a plant lighting program in terms of lower production costs, reduced working time, less fatigue and eyestrain, less spoilage, fewer accidents, better morale. Explains six major steps in initiating, developing and carrying out a lighting program; tells how to select equipment and stresses importance of maintenance. Includes table of recommended levels of illumination for industrial interiors. Benjamin Electric Co.

219 Selection Data on Lighting Fixture Hangers—Catalog 50, 80 pp contains general and detailed information on disconnecting and lowering lighting fixture hangers, accessories, special devices and parts. Utilizes 247 photos and drawings to show

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construction principles, operating features, installations, modifications and component parts for both indoor and outdoor units. The Thompson Electric Co.

MATERIALS HANDLING

221 For Efficient Overhead Handling—Bulletin C-1, 56 pp, pictures overhead equipment for practically all industries. Stresses construction, safety, electrical advantages of trolleys, cranes, track and auxiliaries. Includes layout information. The American MonoRail Co.

222 Trolley Hoists—Bulletin DH-269, 2 pp, describes and pictures ½ to 3 t capacity army-type trolley hoists, plain or geared, for use where a close headroom assembly is required. Gives dimensional and capacity data, prices. Wright Hoist Div., American Chain & Cable Co., Inc.

223 Manual on Electric Hoists—Catalog H-46, 44 pp, covers monorail and stationary hoists and car pullers. Explains fundamental types of grabs, methods of hanging I-beams, types of hoist suspension, controls; gives dimensions. American Engineering Co.

224 Handbook on Overhead Conveying Systems—Manual A-56 provides 300 pp of information on overhead track systems and conveying equipment. Pictures installations, construction details; gives engineering and application data. Richards-Wilcox Mfg. Co.

225 Data on Tramrail Equipment — Twelve-pp Form 2008F is a recently revised booklet on tramrail systems. Tells what an installation can do toward improving handling efficiency. Rail and arch design, switches, cranes and transfer bridges, carries, hoists, cranes, buckets, grabs are pictured. Cleveland Tramrail Div., The Cleveland Crane & Engineering Co.

226 Safe Truck Operation — "Safety Saves!" is a 24-pp booklet setting forth "do's" and "don't's" established as a practical code of truck operation. The admonitions, pointed up by cartoons, are offered as both "refresher course" and fundamental text. Industrial Truck Div., Clark Equipment Co.

227 Conveying Systems Manual — Unloading and conveying of dry pulverized material are discussed in 24-pp Bulletin FK-25. Text covers system and operation; stationary pump, accessories. Fuller Co.

228 Materials Handling Equipment — Illustrated Catalog P602 is a 44-pp guidebook on materials handling equipment for industrial plants. Subjects covered include description and application data on company's gas and electric fork lift trucks, motorized hand trucks, hand lift trucks and hand and electric hoists. Describes attachments available to give trucks versatility. The Yale & Towne Mfg. Co.

229 Metal Conveyor Belts — This 24-pp booklet is an illustrated guide to selection of metal conveyor belts. Presents both conventional and balanced spiral weave belt; covers raised edge and flight constructions, chain edge constructions, high temperature belts, wire conveyor aprons. Includes photos, data on weaving limits, weight, mesh openings, take up for wire conveyor belts. Wickwire Spencer Steel Div., The Colorado Fuel and Iron Corp.

230 Conveyor and Elevator Belts—This 36-pp collection of catalog sections illustrates parts used in construction of company's conveyor and elevator belts. Discusses increased service life and decreased maintenance. The B. F. Goodrich Co.

231 Hydraulic Jacks—Hand, wheeled and gage-equipped jacks from 1½-t capacity models to 100-t capacity extra-heavy duty jacks are covered in Catalog J-50, 16 pp. Illustrated, includes specifications, selection information. Explains construction features. Blackhawk Mfg. Co.

233 Electric Lifters—Medium and heavy-duty electric lifters are described and illustrated in Bulletin LU50. Company's ball bearing hoisting unit is discussed. Economy Engineering Co.

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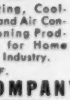

☐ Send me your catalog No. 3550 on Unit Oil Coolers.
☐ Include Catalogs No. 1049 and 1149 on Shell and Tube Bundle Heat Exchangers.

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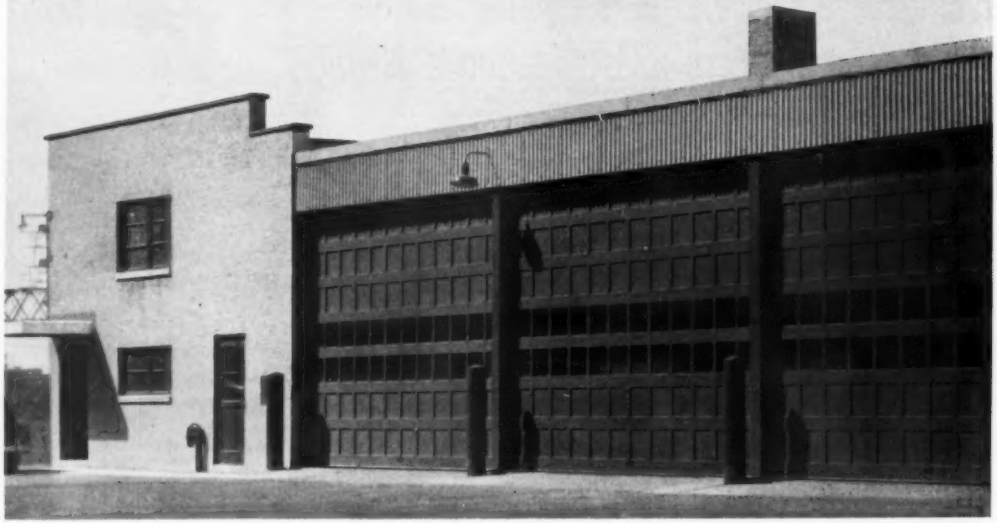
WHEN

BIG DOORS

ARE NEEDED...



BARCOL OVERDOORS

DO A GOOD JOB

Lots of shops — both small and large — need doors that are out-size in various ways. Wider than normal, higher than normal, *high rise required to clear craneway,* extra low headroom, all glass, no glass, special design sections — all these problems, and many more, are familiar experience to Barber-Colman engineers and representatives. Barcol OVERdoors are made in sufficient variety, and have sufficient modifications, to meet practically every unusual condition we have found in over two decades of designing and manufacturing "improved overhead doors". Where power operation is required, we have good equipment of our own for that, too — with a full supply of controls including the surprising Radio Control. For full information, see one of our . . .

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234 Shovel and Loader—Described in 12-pp 1032 is a hydraulic crowd and hoist shovel and loader incorporating many mechanical features usually associated with big shovels. Illustrates, gives specifications, application information on both pneumatic traction and crawler traction models of these front-end loading and excavating machines. Crowd and hoisting action is shown in detail, and various models pictured at work. Advantages of machines stressed. Dempster Bros., Inc.

236 Belt Conveyor Idlers—Bulletin 51-81, 42 pp, presents latest developments of company's belt conveyor idlers and machinery. Includes engineering information helpful in designing and specifying belt idler equipment and cross-section drawings of both steel and cast gray iron idler rolls. New data on a return belt training (self aligning) idler is given, together with material on steep-angle troughed belt idlers and troughed belt self-aligning idlers. Information on lubrication material and techniques provided. Chain Belt Co.

237 Three-Job Unit—This bulletin on company's portable conveyor-loader-stacker features an easy-to-use dimensional chart showing loading and unloading heights and other major dimensions. Also includes specifications, data on optional equipment. The E. W. Buschman Co., Inc.

238 Fastenings for Conveyor Belts—This collection of data covers hinged fastenings, repair plates, lacings, hooks, round belt couplings, also lacers, cutters. Gives instructions for use. Armstrong-Bray & Co.

239 Data on Truck Casters—As much specific information as can be presented in a catalog for commercial usage is included in 105-pp Catalog 124 on truck casters. Besides specifications, ordering data and photos, this well-indexed book includes load capacity charts, defines caster terminology, tells how to select casters and install them. The Bassick Co.

240 Trucks, Casters, Wheels—Catalog 50, 65 pp, covers platform trucks, superstructures, two-wheel and pry trucks, dollies, trailers, casters, wheels, offering a wide range of chassis, superstructure and wheel combinations. Thomas Truck & Caster Co.

241 Drawbar Pull Tractor—Manufacturer's newest Shop Mule, a 12,000 lb, drawbar pull tractor with torque converter is presented in illustrated Bulletin 1545. Gives operating data. The Buda Co.

242 Sheet Lifters—Operational and design features of company's sheet lifting equipment which contribute toward efficient handling, flexibility and economy are explained in Bulletin S-25, 16 pp. Cullen-Friestedt Co.

MECHANICAL POWER TRANSMISSION

243 Manual on Power Transmission Machinery—Containing 225 pp of data, this illustrated handbook covers roller bearings, V-belt drives, friction clutches, couplings, collars, sleeve bearings, pulleys, take-ups and hangers. Provides engineering, selection, ordering information; includes formulas. Dodge Mfg. Corp.

244 Power Drive Handbook—Catalog 709, describing roller chains and sprockets, includes tips on selecting stock roller chains for every type of power drive service. Diamond Chain Co., Inc.

245 Handbook on Chains and Sprockets—An excellent reference book is 216-pp Catalog A418. Discusses various chains and their service applications, metals used in them, and factors affecting their efficiency. Gives selection information on chains for drives and for elevators and conveyors. Engineering data includes dimensions, strengths, weights. The Jeffrey Mfg. Co.

246 Helpful Data on Chain Drives—Catalog HD-51, 32 pp, offers a simple means of determining interchangeability of various makes of roller and conveyor chains. Also supplies information of value in determining proper application of chain drives as a power transmission or conveying medium. Describes and illustrates chain parts and types, provides comparative data, conversion tables, formulas, trigonometrical functions. Whitney Chain Co.

247 Variable Speed Control—Twelve-pp Bulletin G-509, 12 pp, describes basic operating principle of company's variable speed drives and contains representative rating tables and dimension drawings. Covers capacities from ¼ to 87 hp with stepless speed changes within ratios from 2 to 1 to 16 to 1. Reeves Pulley Co.

248 Variable Speed Control Simplified—Bulletin 700 contains some 40 pp of descriptive, application and engineering data on variable speed pulleys and selective speed transmissions. Illustrations show how old and new machines can be equipped with efficient variable speed control. Lovejoy Flexible Coupling Co.

249 Manual on V-Belt Drives—Catalog 280 is pocket-sized, but contains 384 pp of

PLANT REPORT

16,320 holes tapped per 8-hour shift with one machine...every one lubricated with Norgren Oil Fog. 51 taps per chucking.

INSTALLATION:

New type tapping machine built by the Snyder Tool and Engineering Co., Detroit, for use by one of the "big 3" automobile manufacturers. The machine taps 51 holes in an engine block at one chucking; taps 40 blocks an hour; replaces 4 machines in the production line.

PROBLEM:

To obtain uniform lubrication and cooling of all 51 taps and eliminate the use of a messy coolant system.

SOLUTION:

Use of a Norgren Oil Fog Lubrication System consisting of air filters, air pressure regulators, Oil-Fog Lubricators and aerosol distributors. Solenoid valves control intervals of oil-fog distribution to the taps.

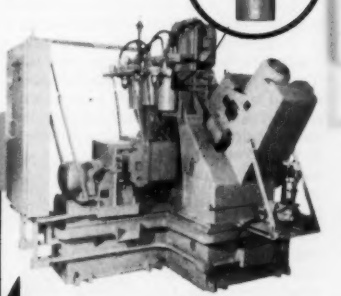
RESULTS:

BETTER TAP HOLES...
...oiled air lubricates, cleans, cools all 51 taps.

LESS TAP BREAKAGE

LONGER TAP LIFE

NO MESSY COOLANT SYSTEM



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CARPETING! In a Factory?

New Mulsomastic Floor in the cutting and shipping room of the lithographing plant of the Piedmont Label Co., Bedford, Va.

THICK-PILE carpeting isn't a practical answer to making factory floors easy on workers' feet. But in the Piedmont Label Company, Inc., when a smooth resilient coating of Tremco Mulsomastic* was put down over a hard, broken cement floor, the foot-relief for employees was so marked it caused Master Mechanic H. J. Faribault to comment, "It's like walking on a carpet."

Mulsomastic is a mastic surfacing that can be quickly and inexpensively put down over old wood or concrete floors by independent contractors or your own crew, under Tremco direction.

It makes a warm, dry, resilient floor —easier to work on—more healthful. It stands up under heavy materials trucking. Paint covers and *stays put* for easy cleaning and good appearance.

Tremco Man Francis Lee, who planned the job with Vice President J. T. Davidson and Master Mechanic Faribault, is one of a large staff of Tremco field men who are prepared by special training, and wide experience to help you find the right answer to many building maintenance problems. If you have a maintenance problem CALL IN A TREMCO MAN. No obligation. The Tremco Manufacturing Co., Cleveland, Ohio and The Tremco Manufacturing Co., (Canada) Ltd., Toronto.

Tremco Man Francis Lee

*Mulsomastic is a registered trade name.

TREMCO

PRODUCTS AND METHODS FOR BUILDING MAINTENANCE

UM 1014

illustrations, tables and other technical information to make it possible to select V-belts for any power transmission drive quickly and accurately. List prices, dimensions included, also a 12-pp supplement on cog belt drives. The Dayton Rubber Co

250 Blocks and Sheaves—Catalog 300-34 24 pp, covers manufacturer's complete line of blocks and sheaves. Provides block number, capacity in tons, number of sheaves, rope size and weight of each block. Illustrations, ratio table and formula included in a section on figuring line parts. American Hoist & Derrick Co.

PUMPS, COMPRESSORS

251 Centrifugal Pump Care—Sixteen-pp Bulletin 08X6256A is a handbook on the care of all makes of centrifugal pumps. Tells how to figure head, determine friction loss. Discusses causes of troubles and their cures, includes maintenance time table. Tells how to prevent cavitation, common mistakes in packing stuffing boxes. Allis-Chalmers Mfg. Co.

252 Centrifugal Pumps—Single- and two-stage pumps for small boiler feed service, cooling tower service, bottle washing, brine circulation, general water service, hot well service are described in Bulletin W-306-B1. Includes ratings. Worthington Pump and Machinery Corp.

253 How to Solve Pumping Problems—Form 3060 is a 130-pp manual on selection, use of pumps. Tells type of pump construction best suited for handling 150 liquids. Explains how to determine size, compute suction list and discharge head, determine direction of rotation and size of speed of pulleys or gears. Gives instructions for installing rotary pumps, locating trouble. Geo. D. Roper Corp.

254 Steam Heating Pumps—Twenty pp of information on vacuum and condensate pumps are presented in Bulletin 1401. Covers vacuum pumps from 2500 to 65,000 EDR, providing an illustrated description of vacuum pump operation, detailed data on working parts, a table showing standard air and water capacities, rating and testing procedures, dimensions. C. A. Dunham Co.

256 Stainless Steel Pumps — Centrifugal pumps described and illustrated in 8-pp Bulletin 725.3 are designed for handling corrosive liquids. Pump design is explained and parts identified. Specifications, dimensions included. Goulds Pumps, Inc.

258 Condensation Return Units—Bulletin 113-ST describes and illustrates packaged condensation return units for small, low pressure uses, covering pump capacities of 1½ to 22½ gpm. Aurora Pump Co.

259 Centrifugal Pumps—Twenty-pp Bulletin CT50 presents pump specification and cost information in table form; includes a selection table for both belt driven and direct connected centrifugals. A clear cross section with notations shows engineering features of the manufacturer's line. Includes engineering and pump data along with formulas and conversion tables. The F. E. Myers & Bro. Co.

260 Multi-Stage Compressors — Featured in 36-pp Bulletin 116 is a presentation of engineering data and performance characteristics to enable plant engineers to approximate power requirements, rotative speed and discharge temperature for most multi-stage centrifugal compressor applications. Clark Bros. Co., Inc.

MAINTENANCE

261 Drip Preventive Handbook — Insulation of pipelines, tanks, cold air conditioning ducts and wall surfaces against corrosion and condensation drip is covered in pocket-size 32-pp Form P-17. Describes coatings, tells how to apply. Includes coverage tables. J. W. Mortell Co.

263 Iron Cement Handbook — This is a 40-pp pocket-size catalog of iron cements for repair, other uses. Tells how to mix and apply them. Gives illustrated instructions for dozens of repair and maintenance jobs. Smooth-On Mfg. Co.

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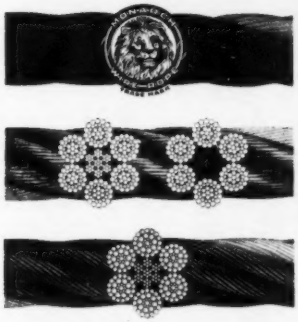

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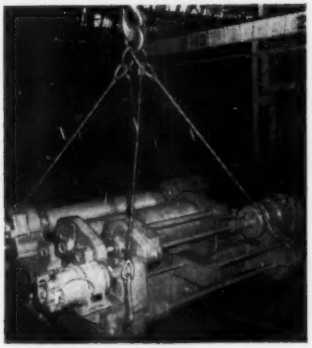

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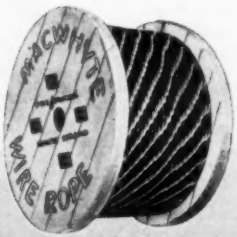
Catalogs available on request. Write Macwhyte Company, 2991 Fourteenth Ave., Kenosha, Wisconsin.



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At 5:05 P.M. Friday the Boss waved goodbye to his staff. "Have a nice weekend," he smiled.

On the way out he nodded to Andrew, his watchman. "Good man," he thought, "been on the job a dozen years. The plant is safe in his hands."

Not having a DETEX GUARDSMAN Watchclock to supervise Andrew, he had no way of knowing that the watchman was in the habit of goofing off—especially on weekends.

The following night a fire broke out in the locker room. Poor Andrew was asphyxiated in his sleep. The plant—a smoking ruin—machinery, inventory, records!

Quit playing ostrich with your firm's destiny. Today investigate the DETEX GUARDSMAN Watchclock System, which proves the worth of a good watchman and quickly exposes a shirker. MOST IMPORTANT, the GUARDSMAN never relaxes its vigilance — even on long weekends and during extended plant closings. You can't afford a "lost weekend" . . . . . write for free folder.

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264 One-Coat Insulation — This 32-pp booklet describes company's Type D insulation, a sprayed-on coating for surfaces with temperature range from —40 to 300 F. Tells how one application of this coating not only insulates but also waterproofs, rustproofs, deadens sound, prevents condensation and resists fire. Tells how to apply, discusses K factor, bonding properties; describes specific uses—tank surfaces, heat ducts, metal surfaces of large buildings. Insul-Mastic Corp. of America.

265 Corrosion-Preventive Coatings—This 16-pp illustrated booklet covers a family of products for fighting corrosion. Presents characteristics and application data on hot and cold applied tar base coatings, alkyd resin coatings, chlorinated rubber base coatings, vinyl and phenolic coatings. Includes finder chart. Protective Coatings Div., Pittsburgh Coke & Chemical Co.

266 Why Good Cement Floors—Importance of quality concrete floors and factors involved are explained in this 8-pp bulletin. Discusses installation procedure and maintenance of company's cement flooring, its durability, other advantages, use for resurfacing as well as for new installations. Kalman Floor Co., Inc.

267 For Floors That Take Beatings—Twelve-pp illustrated booklet, "Why Engineer an Industrial Floor," points out why installation of industrial floors for maximum life and minimum cost is a task requiring experienced planning, skilled execution and exacting cost control. Describes how floors can be engineered to withstand moving and deadweight loads, shock and vibration, extreme temperatures, oils, greases, chemicals and industrial wastes, etc. Flash-Stone Co., Inc.

269 Floor Maintenance—This 12-pp brochure presents a complete and economical program for the care of wood and concrete floors, terrazzo, linoleum and tile. Points discussed include wear resistance, appearance, sanitation, cleanliness, light reflectance, sealers and hardeners, burnishing and buffing. The Tremco Mfg. Co.

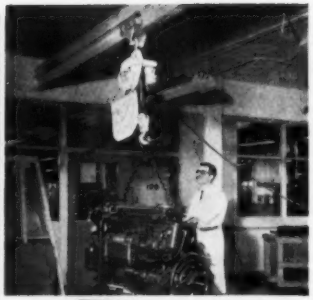
270 Protective Surfacing — Bulletin 1570 presents specifications and characteristics of company's silicone coating aluminum, telling some of its uses and advantages. The Dampney Co. of America.

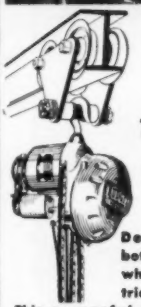
CONSTRUCTION

271 Roofing Manual—Engineering data on roofing is given in Specifications 50, 30 pp. Covers coal tar pitch roofings, waterproofings, insulations, flashings, protective coatings. Includes illustrated instructions. Tar Products Div., Koppers Co., Inc.

"The heck with your college diploma and references. Let's see your union card and muscles."

272 Building Panel Engineering Data—This 40-pp reference book on use of steel and aluminum panels for walls, decks and roofs, discusses their use, advantages, methods of installation. Covers acoustically treated panels, fire resistance ratings, electrification, acoustic roofs, reinforcing floor forms. Penestra Building Products Co.





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The 'Budgit' Electric Hoist is a complete lifting unit. No extras to buy; no installation expense. Unpack, hang up, plug into the nearest electric socket, and use! New efficiency and savings begin immediately. Capacities range from 250 to 4,000 lbs., prices from $119. Call your distributor or write us for informative Bulletin No. 391.

A 'BUDGIT' I-BEAM TROLLEY **makes any hoist more useful. Adjustable to fit various I-Beam sizes. Made of tough steel and equipped with ball bearings. Capacities: 500 to 4,000 lbs. Prices from $13.50. Write for Bulletin No. 390.**

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Rex Standard Bucket Elevators are made in 3 basic designs to fit virtually every type of service . . . Centrifugal Discharge type, Continuous Bucket type and Super Capacity type. The big advantages you get with Rex are that all major components—buckets, chains, sprockets, housing—are made by Chain Belt Company. One responsibility . . . one high standard of quality . . . one sure measure of performance.

Another important point to remember is that when you specify Rex, you get the help of trained bucket elevator specialists . . . men who devote themselves exclusively to bucket elevator problems and are particularly well qualified to give you a "helping hand." They have behind them over 40 years of experience to help solve those special problems where standard elevators are not suitable.

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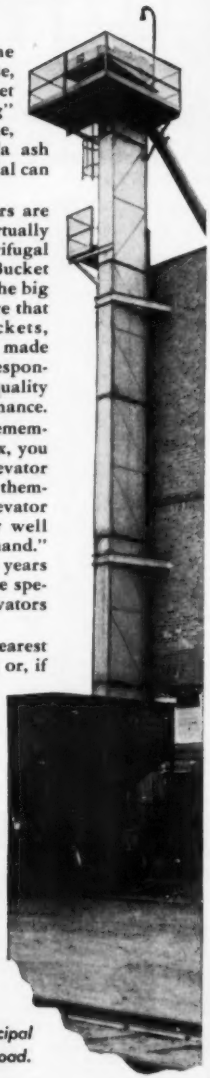

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Here's How

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1...Stopped serious damage to building walls

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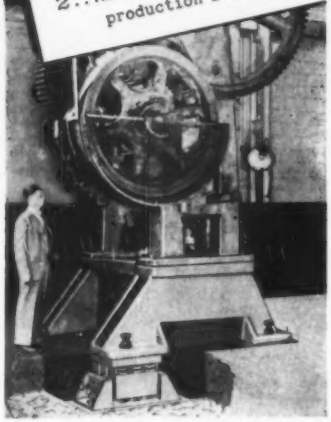

Huge 600 ton capacity press weighing 100,000# at Hawthorne Metal Products Company, Royal Oak, Michigan. Special 25,000# capacity Korfund Steel Spring Vibro-Isolators installed directly under the press weigh 600# each.

..by controlling shock

Shock from this big press was cracking building walls. To maintain heavy production schedules, this condition had to be remedied — fast.

Korfund's Detroit representative was called in, analyzed the problem, and 'phoned in the important data to the Korfund factory. Korfund engineers immediately started designing and building the special Isolators.

Seven days later, they were shipped!

This press has now been in daily operation for over a year, and shock transmission to the building has been completely eliminated. Yet the 100% effective Korfund Isolators cost less than 3% of the press cost.

For less critical installations, there are even less expensive standard stock Isolators. A Selector Chart in Bulletin G-104 gives recommendations for both normal and critical conditions. See Sweet's Catalog Files, or write us for your free copy today.

We'll gladly submit recommendations, without obligation. A half century of experience is at your disposal.

Representatives in Principal Cities

KORFUND VIBRATION CONTROL — SPRINGS — RUBBER — CORK

THE KORFUND COMPANY, INC.

48-35R Thirty Second Place · Long Island City 1, N. Y.

273 Glass Block and Where to Use It—This 32-pp book gives design data, information on functional and decorative aspects of glass block. Covers properties, specifications, erection procedures. Insulux Div., American Structural Products Co.

274 Technical Data on Plexiglas — This is a file folder of information on Plexiglas sheets, rods, molding powders, covering workability, properties, thicknesses. Discusses large area lighting. Rohm & Haas Co.

275 Technical Manual on Plywood—Available basic data on Douglas fir plywood, its properties and use, are offered in looseleaf sections with firm binder. Presents engineering information about this panel material and its performance in varying applications. Covers commercial standards, designing with plywood, prevention of condensation, lateral bearing strength of nailed plywood joints, deflection. Please give your title when requesting this book. Douglas Fir Plywood Assn.

276 Basic Roofing Information—"What You Should Know About Your Roof" is a 40-pp illustrated booklet which tells what makes a roof fail, how to recognize signs of roof deterioration, what to do to keep a roof in good condition. Discusses recommended roofing practices, essentials of a good re-roofing job, also, special features of company's roofing materials. Johns-Manville.

VENTILATING, AIR CONDITIONING, DUST CONTROL

277 Dust Control—Bulletin 98 explains value of industrial dust control and principles of dust suppression, collection by filtration. Describes dust control equipment, providing specifications, dimensions on filters, systems, automatic controls The W. W. Sly Mfg. Co.

278 Improved Air Conditioning—Advantages and applications of a controlled humidity method of air conditioning are discussed in Bulletin 112. Process is explained, illustrated. Niagara Blower Co.

279 Vacuum of Many Jobs — Bulletin 144, 20 pp, describes and illustrates 132 unusual industrial uses for company's vacuum system. The Spencer Turbine Co.

280 Dust Control Technology — Detailed selection, operation and maintenance data are contained in this 50-pp digest-size book, "Industrial Dust Control Through Exhaust Systems." Treats exhaust hoods, piping systems, dust collecting equipment, exhausters and drives. Lists basic methods of dust control and analyzes elements of exhaust systems. Discusses control of air movements, recommended hood and enclosure design, exhaust air velocity and volume and rules for installing system piping. Pangborn Corp.

281 Wet Method Dust Collection—Besides presenting company's line of Multi-Wash dust collectors, dewatering tanks and pumps, 20-pp Bulletin 510 explains advantages of wet method of dust control, discusses both simple installations and those requiring additional equipment. Covers in detail the widely used Senior collector, the Junior collector for single function operations, settling and dewatering equipment, also pumps and separators. Claude B. Schneible Co.

282 How Conditioning Units Can Help—The advantages of self-contained units in cooling, dehumidifying, cleaning are cited in 40-pp Catalog 1307. Explains installation, operation. Provides data on direct expansion and cold water cooling, hot water, steam heating. Clarage Fan Co.

284 Dust Recovery — **"Engineered Efficiency in Dust Collection and Recovery,"** 36 pp, discusses industrial dust recovery from standpoints of nuisance abatement, waste avoidance, hazard elimination. Shows effect of variation in particle size distribution and specific gravity of dust on efficiency. Buell Engineering Co., Inc.

285 Replaceable Air Filter—Introducing the Amer-glas filter, which comes in standard sizes for forced heating, ventilating

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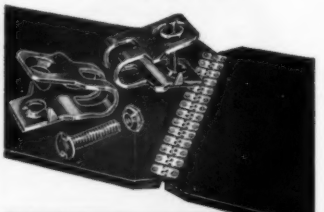

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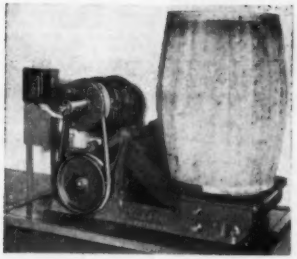

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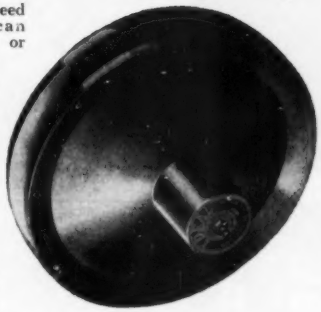

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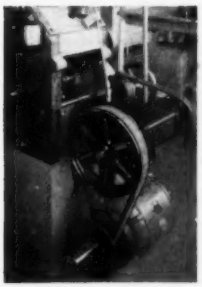

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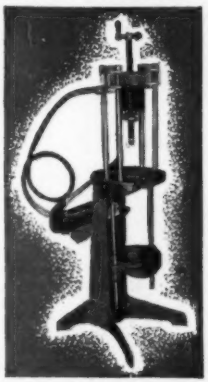

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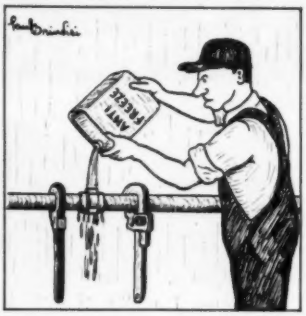
and air conditioning systems. Bulletin 211 explains its operating principle, discusses its resiliency, efficiency and maintenance. American Air Filter Co., Inc.

286 Heavy Duty Ventilation Filters — Form DPF-100.LH presents a dry panel filter with a filtering area of 23 sq ft. Tells features, uses; includes installation data, filter selection chart. Dollinger Corp.

PIPING, VALVES, TRAPS AND FITTINGS

287 Design Properties of Pipe—This 12-pp booklet consists of tables listing pipe sizes and wall thicknesses currently established as standard, plus what is believed to be the most nearly complete tabulation ever published of dimensional properties of commercial steel pipe. Tube Turns, Inc.

288 Piping Pointers—This is company's popular piping manual covering fundamentals of sound piping practices. Discusses various types of valve designs and how each should be used. Pictures and names more than 80 kinds of fittings and contains many illustrated how-to-do-it features. Included with the manual is an 8-pp valve selection guide. Crane Co.



290 Steam Hook-ups—This 64-pp manual on hook-ups for steam traps, air vents and temperature controls provides diagrams, size calculations, selection data on traps and regulators, properties of saturated steam, dimensions. Sarco Co., Inc.

291 How to Choose and Use Air Traps—Bulletin 202 describes air trap selection and installation for automatic drainage of moisture from compressed air intercoolers, aftercoolers, receivers, separators and drip points. Armstrong Machine Works.

292 Safety Head Catalog—Section 10, Part 1 of Catalog 54, 52 pp, contains charts and tables covering almost any phase of safety head information. Tells where safety heads can be used and how to use them. Gives advantages of manufacturer's line in protecting pressure equipment. Tells how to choose safety head assemblies and rupture discs. Includes tips on lowering temperature at point of safety head location. Black, Sivalls & Bryson, Inc.

294 Automatic Valves — Pressure, flow, and liquid level controls for steam, air, gas and fluids are shown in 90-pp Catalog A-50. Includes dimensions, prices, capacity charts, conversion tables. Davis Regulator Co.

295 Strainers and Separators — Bulletin R-46-50A is a 16-pp catalog on T-type strainers, suction strainers, multi-flow and receiver separators. Contains dimensions, prices. American District Steam Co.

297 Forged Steel Valves—Form 800-A illustrates and describes 600-lb forged, steel valves for high line pressure and temperature applications, giving dimensions, prices. The Ohio Injector Co.

299 Solving Steam Trap Problems—This popular 36-pp catalog on steam traps contains specifications and capacities on steam traps, float traps, air release valves and pipe line strainers. Tells how to calculate condensation loads and select traps for all

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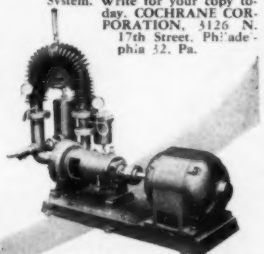

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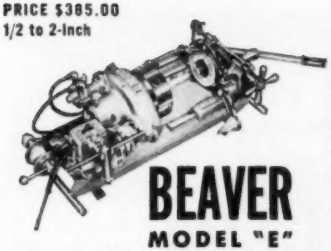

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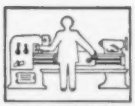

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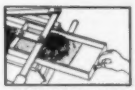

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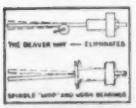

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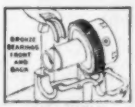

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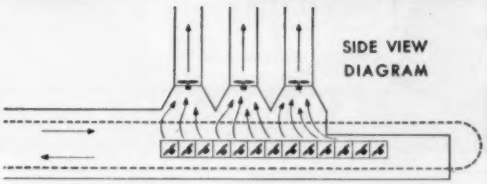
How RHEEM cools off 500° lithographed metal in 5 minutes



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301 **Steam Trap Reference Manual**—Bulletin T-1740, 24 pp, tells why and where steam traps should be used; explains desirable trap features. Advantages of company's impulse steam traps are described, their operation illustrated. How to figure traps sizes and how to size condensate return lines are told and capacity and pipe dimension charts and thermodynamic properties of saturated steam included. Also provided are installation and operating tips, prices. Yarnall-Waring Co.

303 **Flexible Hose, Bellows** — Catalog CMH-123 NPH, 16 pp, describes and gives specifications for manufacturer's line of Flexon bellows and flexible metal hose. Information on metallic bellows of stainless steel, brass, bronze and other alloys is included, covering bellows used in many types of control, regulators and thermostatic devices. A selection guide is provided for steam traps, valves, shaft seals. Also covers flanges, couplings. Flexonics Corp. (formerly Chicago Metal Hose Corp.).

FUEL OILS, LUBRICATION

306 **The Why, What and How of Lubricants** — This 20-pp booklet explains and illustrates common tests and terms describing lubricants. Covers viscosity, flash and fire, neutralization, number, penetration, specific gravity, extreme pressure, steam emulsion, corrosion. Tide Water Associated Oil Co.

308 **Lubrication of Refrigeration, Air Conditioning Equipment**—Revised Technical Bulletin B-3 is a 56-pp illustrated manual filled with practical tips on good lubrication practice for both large systems and small units. Discusses types of refrigerating systems, functions of essential parts, characteristics of refrigerants, effect of refrigeration on oils, lubrication recom-

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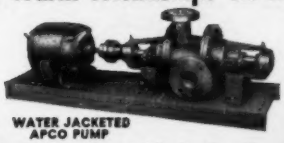

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309 Cooperative Technical Consultation Service—This 24-pp booklet presents company's periodic consultation service offered to industrial plants and aimed at efficient use of petroleum products. Covers services available in solution of lubrication problems, metalworking operations, processing, fuel and heating oils, dust control. Gulf Oil Corp., Gulf Refining Co.

310 Lubricant Data Book—This pocket-size 56-pp booklet gives product information and principal uses of approximately 40 lubricants of both grease and fluid types, and general directions for proper application. Discusses lubricant requirements of equipment in 25 major industries. Lubriplate Div., Fiske Brothers Refining Co.

311 Lithium Soap Greases — Twelve-pp Booklet AD 3084, on manufacturer's Stanolith greases, explains how they withstand both high temperatures and wet operating conditions. Discusses two grades—one recommended for central dispensing systems, and a heavier grade for compression cups or pressure gun applications. Difficult lubrication jobs succesafully handled by Stanolith greases are described and pictured, including bearings of a milk can washer, air conditioning units in a meat packing plant. Standard Oil Co. (Ind.)

312 How Lubricators Helped—Blueprint 106 is an industrial case history telling how die life was greatly increased and other wire forming operations improved by use of manufacturer's die lubricator. Includes operating and installation data. C. A. Norgren Co.

INSTRUMENTS, CONTROLS

313 Industrial Control Devices—Catalog 8303, 64 pp, presents 100 models of non-indicating electric, electronic, and pneumatic controllers for flow, pressure liquid level and humidity applications. New instruments shown include electronic temperature controllers. Brown Instruments Div., Minneapolis-Honeywell Regulator Co.

314 Handbook on Automatic Controls—Catalog 700 provides 45 pp of ordering and application data on automatic controls with mercury contact switches. Covers control equipment for temperature, pressure-low water, liquid level, boilers; transformer-relays, control valves, mercury switches. The Mercoid Corp.

315 Heating-Air Conditioning Controls—A complete and informative ordering book for thermostats, motor-operated valves and accessories for heating, ventilating and air conditioning applications is offered in 48-pp Catalog F-1753-3. Compiled to aid in selection of control equipment to meet rigid specifications, book is illustrated, provides application and installation data, dimensions, ratings. Barber-Colman Co.

317 Gages for Many Jobs—Sixty-eight pp of liberally illustrated information is offered in Catalog 64. Describes a variety of gage types; air volume controls for pump installations, vapor tension thermometers, d-c ammeters and voltmeters, and water flow meters covered. Includes engineering tables. United States Gauge Div., American Machine and Metals, Inc.

HEATING

319 Plumbing and Heating Supplies—Edition F is a 118-pp catalog listing over 2500 repair parts and precision tools for maintenance of all types of plumbing fixtures. Fully illustrated, includes plumbing fixtures. J. A. Sexauer Mfg. Co., Inc.

320 Heat-Transfer Equipment—An excellent source of information on shell and tube heat transfer equipment, 28-pp Catalog DM-1150 covers heat exchangers, tank suction heaters, oil preheaters, condensers, evaporators, after-coolers, gas coolers, centrifugal pumps and water heaters. Instructions for installation, operation and maintenance are included. Bell & Gossett Co.

321 How to Save Waste Heat—The utilization of unit heaters for recovery and distribution of waste heat from engine and compressor jacket water is covered in 4-pp Form 00531A. Method of using waste heat to lower space heating costs is explained. Modine Mfg. Co.

322 Heating, Air Conditioning Book—Bulletin PB-200, 36 pp, is a complete, condensed catalog covering company's full line of air conditioning, heating, ventilating and heat transfer equipment. Supplements some 40 specialized bulletins on various product lines. Presents terse descriptions, cutaway drawings, photos, construction feature, sizes. The Trane Co.

323 Heat Insulation—This 8-pp booklet on hydrous calcium silicate insulation is illustrated with graphs, tables and drawings showing numerous ways this insulation is used in industrial and commercial projects for temperatures up to 1200 F. Lists the wide selection of shapes and sizes available to insulate tubes and pipes from ¼ to 72 in. dia and vessels from 72 in. to 60 ft, also flat surfaces. Also gives data on physical characteristics, recommended thicknesses. Kaylo Div., Owens-Illinois Glass Co.

TOOLS

326 Pipe Tool Operating Guide — Form O.G. is a concise 4-pp folder prepared to help users get best results from portable pipe and bolt machines and hand pipe tools. Tells quickly how to locate and correct pipe machine and hand pipe tool troubles. Beaver Pipe Tools, Inc.

328 Powerful Puller—Introduced in Bulletin 97-A is the compact Power-Twin, a fast-working hydraulic ram. Shows how this ram, with its center hole feature, can convert all of company's pulling systems to hydraulic push, pull or lift operation. Owatonna Tool Co.

329 Cutting Tool Maintenance—Booklet 10, 72-pp, is loaded with information about tool grinding and well illustrated with

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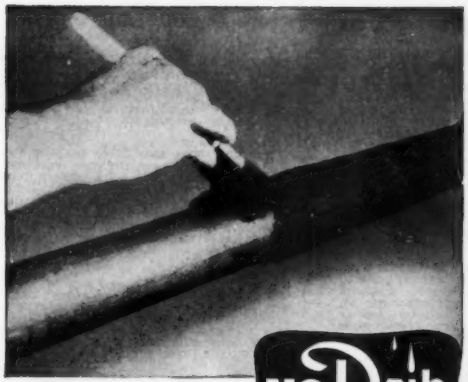

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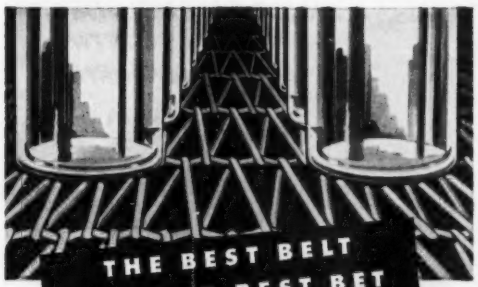

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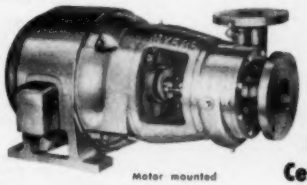

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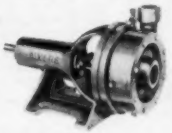

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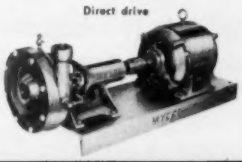

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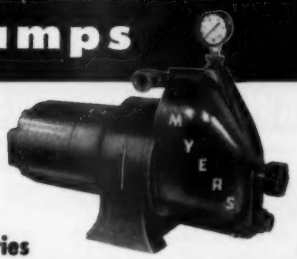

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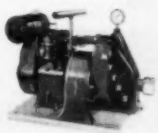

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WATER CONDITIONING

330 For Conductometric Determination of Solids—A quick and simple method for determining solids content of boiler water or condensate is explained and illustrated in Bulletin 2RE50. Hall Laboratories, Inc.

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331 Hydrogen Zeolite Softeners—Publication 4530, 16 pp, presents hydrogen zeolite (cation exchange) water softening equipment. Gives a complete description of the process and the field of application, showing advantage of hydrogen zeolite softening and its relation to older sodium zeolite softening process. Cochrane Corp.

ENGINES, GENERATORS

332 Turbine Generators—Bulletin H-18, 40 pp, covers turbine-generators of 500 kw and above, pictures nearly 50 turbine-generator installations, both utility and industrial. Brief discussions of generator and exciter cooling methods are included. A reference section offers detailed drawings showing a typical turbine condenser installation arrangement. Elliott Co.

333 Packaged Steam Generators—This new 16-pp booklet on steam generators is profusely illustrated in color, providing photos, cut-away and schematic drawings and describing in detail the construction and operating principles. Explains induced draft, dry steam, four-pass downdraft design, 5 sq ft of heating surface per Bhp, flexibility of operation, and oil, gas and combination gas-oil burning equipment. Superior Combustion Industries, Inc.

336 Packaged Generators—Bulletin SB-38, company's Keystone model. Photos and sketches show complete unit, pressure element and details of its compact design. Gives advantages of two-drum water boiler, three-pass gas travel, automatic gas or oil burner. Dimensions, capacities. Erie City Iron Works.

PACKINGS, SEALS

337 Data on Packings—Form 428 is a collection of bulletins on flexible metallic packing, semi-metallic packing, rotary mechanical seal, oil pressure system and steel packing tools. Durametallic Corp.

339 Metallic Packing—This folder is devoted to company's elastic metallic packing intended for frictionless operation by means of an oil seal. Photos and text tell how seal is constructed, operates and is used in compressors, engines, pumps. A. W. Chesterton Co.

COOLING

340 Jacket Water Coolers—Illustrated Catalog 1351 describes a line of engine jacket water coolers described as extremely rugged units capable of withstanding abuse of portable equipment installations. Details new design features of the units. Young Radiator Co.

341 Industrial Dry Coolers—Illustrated Bulletin DC-50, 12 pp, presents dry cooling equipment for small, "in-between," and heavy-duty cooling jobs and includes three recent models. Two are small "portable" units and the third a medium-size unit. Although designed primarily for cooling engine jacket water, they can be used for cooling nautral gas, lube oils, fluids of refining stages. The Marley Co., Inc.

342 Heat Exchangers—Bulletin 11.0.080 describes air cooled heat exchangers for condensing or cooling of steam or process vapors, natural gas, jacket water, lubricating oil, quenching baths. Equipment Div., J. F. Pritchard & Co.

OTHER EQUIPMENT

343 The Cost of Excess Moisture—Thirty-pp Bulletin 216 explains that while high humidity doesn't show it can spoil many products in process and storage. Tells how typical plants have solved the excess moisture problem by electric dehumidifiers. Pittsburgh Lectrodryer Corp.

344 Wire Cloth and Screen—This 48-pp handbook offers valuable help in selecting and ordering industrial wire cloth and woven wire screens. It's illustrated with photos showing wire sizes, spacing, weaves and crimps and types of openings. It discusses applications of different types and metals used. Includes weights. Korb-Pettit Wire Fabrics and Iron Works, Inc.

345 Standard Screw Products—This 10-pp booklet about "Unbrako" standards,

(Continued on page 168)

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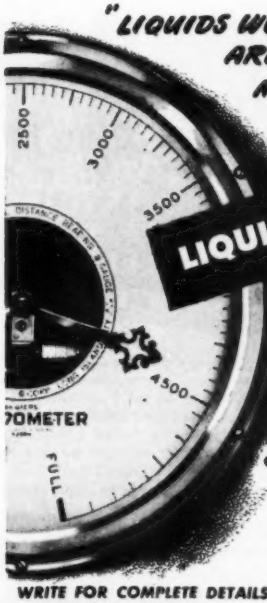

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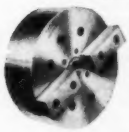

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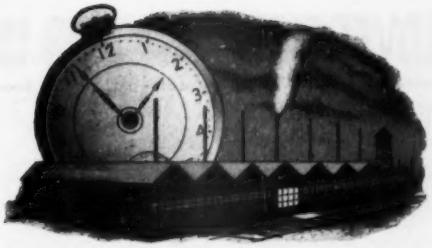

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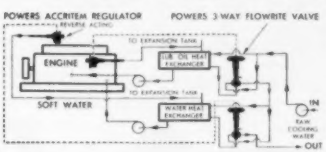

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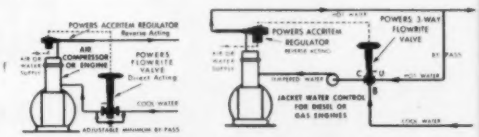

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tells what they are and the advantages of their use. Gives detailed information on socket head cap screws, self-locking socket set screws, socket set screw points, flat head socket cap screws, shoulder screws or stripper bolts, pressure plugs, square head set screws and dowel pins. Standard Pressed Steel Co.

346 Intercom System—A communication system which is custom tailored to individual plant conditions and designed for both two-way conversation and paging applications is described in this 25-pp booklet. Text tells how system is easily installed and is adapted to different noise levels. Gai-Tronics, Inc.

347 Magnetic Selection Guide—Twelve-pp illustrated Catalog C-5000-B, describing manufacturer's entire line of magnetic separators and lifting magnets serves as handy guide to the selection of magnets from the application standpoint. Tells which magnets to use to remove iron from wet or dry materials carried on conveyor belt, chutes, ducts. Dings Magnetic Separator Co.

348 Dry Chemical Extinguishers—New quick-acting fire extinguishers of the dry chemical type in 20 and 30 lb sizes are covered in Form C-104. C-O-TWO Fire Equipment Co.

349 Elevated Steel Tanks—Welded steel tanks with ellipsoidal bottoms and roofs are presented in this 24-pp booklet as an economical means of increasing plant water storage capacity, maintaining uniform pressure, meeting peak loads and reducing pump costs. Chicago Bridge & Iron Co.

351 Easier Machine Installation—Bulletin 415 describes low cost machine mountings that simplify machine installation, control vibration, reduce noise and absorb impact. The MB Mfg. Co., Inc.

352 Solder Text—This 36-pp book is basically an editorial treatise. Separate sections are devoted to thermal effects, mechanical properties, principles of soldering and fluxes. Selection of proper solder for the job is explained, and fusible alloys described. Practical suggestions and description of company's solders are provided, also technical data. Federated Metals Div., American Smelting and Refining Co.

353 Power Brushes—Bulletin C-269, describing company's new power brushes, pictures their design. The Osborn Mfg. Co.

354 Axial Flow Blowers—Described in this bulletin are compact, axial flow positive pressure blowers for handling gas or air under pressure or vacuum. Blower-Stoker Div., Read Standard Corp.

355 Tips on Plant Protection—Instructive information for engineers whose plants are engaged in defense production is furnished in this 16-pp manual. It is intended to solve plant protection problems by instituting security systems for preventing loss of life, damage to property. Training of personnel, planning of hourly routes, safety factors, fire prevention are discussed. Detex Watchclock Corp.

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Don't let metal scrap lie idle. It's vital to keep America's production at peak level. Steel producers need 37,000,000 tons of scrap a year to serve you and America. Remember: today's scrap is tomorrow's production of steel for the American Way. It can also make the tanks, guns, and shells to protect our future security. In the shop . . . or out in the field . . . clean up after *every* job — and *"Get in the Scrap!"*

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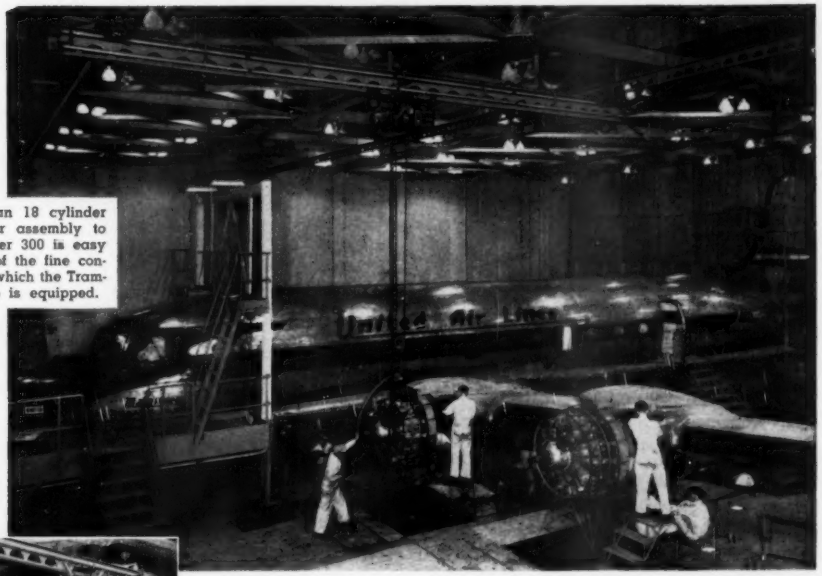
Producers of Steel for Industry and Construction

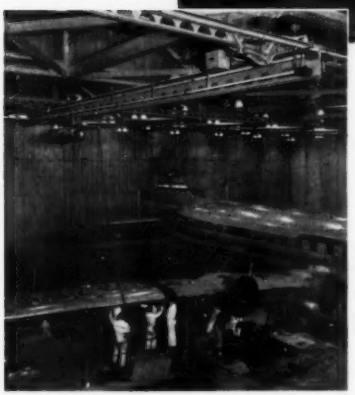
LACLEDE STEEL COMPANY

St. Louis, Mo.

TRAMRAIL CRANES serve United Air Lines San Francisco Base



Spotting an 18 cylinder engine for assembly to a Mainliner 300 is easy because of the fine control with which the Tramrail crane is equipped.



Assembling an outer wing section to an inner wing is a delicate job that is greatly simplified by the push-button-controlled Tramrail crane.

ACCURATE SPOTTING OF LOADS A BIG FEATURE

All planes of the United Air Lines are flown regularly to the company's mammoth, modern "Push-button" maintenance base at San Francisco Airport for servicing. While various intermediate servicing operations are conducted at other hangars along the flight routes, this is the main maintenance base where planes are given complete overhauls.

The planes are dismantled in three large duplicate shops located at one side of the building. These shops, which easily accommodate United's huge Mainliner 300's, are each served by a 3-ton fully motorized Cleveland Tramrail crane.

Bridge and carrier travels of the cranes are provided with automatic accelerating control. With this control various speeds are obtained automatically by depressing the pendant push-buttons. Hoists are provided with variable-speed push-button control. This control makes it possible to spot loads accurately, which is of extreme importance. For instance, when engines are installed, there is a myriad of pipes and fittings that must be matched precisely without damage.

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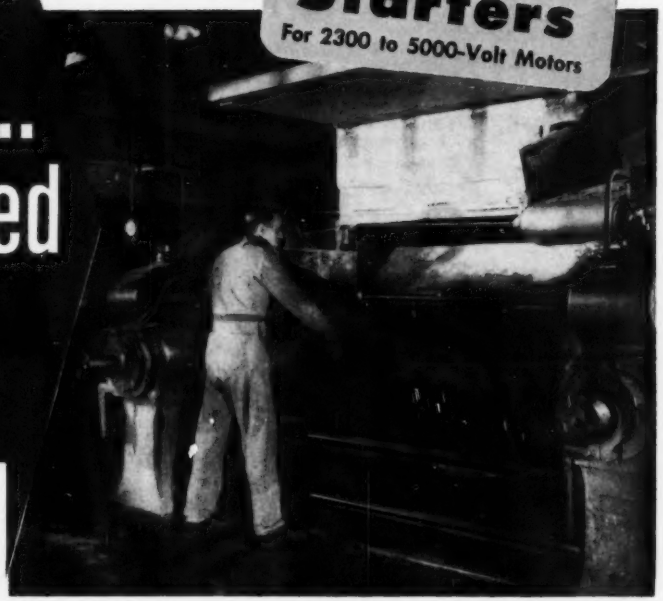

WORKING THE RUBBER on this 84" mill line takes controlled power . . . the power of a 300-horsepower synchronous motor and the control of a reversing, dynamic braking starter . . . an Allis-Chalmers Type H Starter engineered specifically for the job.

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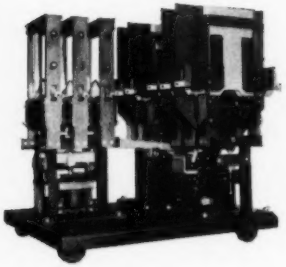

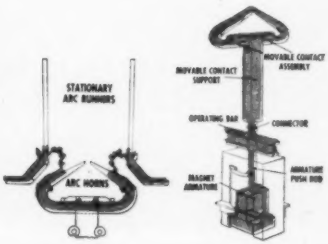

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MARCH 1952

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